ELECTRICAL CONTRACTING
VOLUME 37
July-December
1938
Part 2

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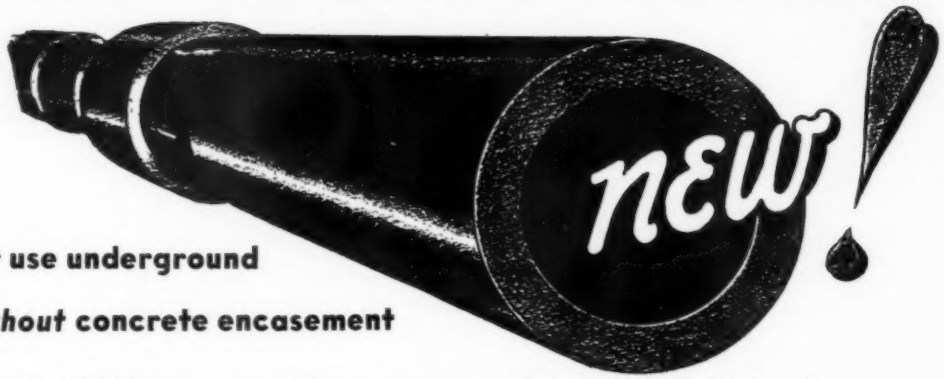

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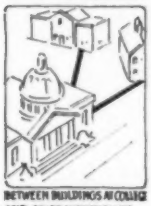
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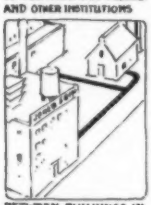
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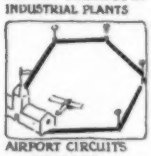
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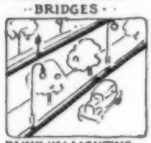
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electrical contracting

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Established 1901

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WADSWORTH has one of the "finest" Switching Mechanisms and the construction is unique. The action of the cam when opening switch draws the "arc" down into the narrow non-ventilated slot where it is simultaneously quenched.

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Take a Wadsworth Switch apart . . . examine carefully . . . piece by piece . . . and you will realize at once they are made of good materials. You will see, too, that every part is carefully made and fitted together to work smoothly and to stand up under hard use.

WADSWORTH SWITCHES are designed to provide that "Factor of Safety" necessary for long and satisfactory operation. All current carrying parts are made extra heavy. The terminals are in plain sight and easy to connect. There is ample wiring space, too, . . . and . . . with plenty of well placed Knock-outs they sure are easy to hook up. Wadsworth Switches are built to meet the contractors' problems.

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JULY, 1938

Behind The Beard

IN THE OLD DAYS IT WAS EASY. When a man indulged in crime or a bit of sweet sin, he put on a red wig and green whiskers. He lowered his voice three notches. He wore gum shoes.

BUT NOW WITH FINGERPRINTS and lie detectors, G-men and tabloids, it's not so simple. Before the swindle is complete or Little Nell is ripe for suicide, somebody yells—"Come out, Jack Derringer, from behind that beard!" Today all men stand naked before their fellows.

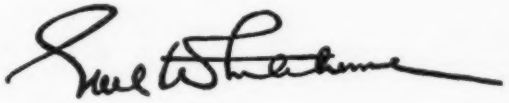
SO DOWN AT HOT SPRINGS at the Jobbers' Convention there was gossip. Too many contractors are now securing wholesale discounts on electrical products but not performing a wholesale function. It's all over the country. It hurts all wholesalers—all other contractors. It is not fair trading.

NO MAN CAN FIND FAULT with any contractor, of course, who also actually engages in wholesaling. Here each business takes its own profit. But when the purpose is to wangle wholesale profits on materials, to help him undercut competitors on construction, that's gum shoe work. Then the others *should* find fault—and do something about it.

THE ROBINSON-PATMAN ACT PROHIBITS this unfair practice by manufacturers, so the lawyers say. Maybe it will bite some day. Meanwhile, the harm is done locally and local action should be applied.

FOR CONTRACTORS AND WHOLESALERS CAN CHOOSE from what suppliers they will individually buy. They can decide with whom they will associate. They can express their indignation both against manufacturers who grant wholesale discounts to men who do not render the wholesale function and against contractors who figure wholesale prices into construction jobs and depress local markets.

PITILESS PUBLICITY IS THE BEST DEFENSE against this misdemeanor. For when all the local industry knows this one gets extra discounts from that one to use against the rest, the green whiskers stand forth and its time to shout—"Come out!"



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for Adequate Wiring

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You will benefit if you are ready!

Adequate stocks are a vitally important necessity in providing adequate wiring. Graybar makes these stocks—every electrical product for every electrical need—readily available to Electrical Contractors everywhere.

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LAYING OUT *feeders, panelboards and branch circuits according to code requirements on actual job plans. Runs must be planned for minimum line loss and a bill of materials prepared for each part of the job.*

Young Men for Wiring

While Other Contractors Are Wondering About the Apprentice Indenture Idea, Wisconsin Is Giving it a Whirl, with Interesting Results.

By W. T. Stuart
Middle-West Editor

EVER since business hit the skids in the late twenties and electrical contractors quit taking on more mechanics, the need for apprentices has been under discussion. Men who think for the future are worried. The present generation of wiremen is getting older. Few youngsters are in training.

NECA set up a committee to study the problem under Walter Collins, secretary of the Chicago Electrical Contractors Association. He has sounded loud warnings with facts you cannot dodge. He wants the industry to adopt a system of indentured apprentices. But contractors wonder how it will work out. Meanwhile, Wisconsin has been doing some experimenting.

THEORY *of electrical circuits, mathematics and the application of electrical formulas are included in the "book learning" the apprentice must absorb during his indenture period. Instructor Briese with apprentice Art Kleenman in Madison, Wisconsin.*

At the first of the year, there were 49 indentured electrician apprentices in that state, a fraction of the total number of embryo electricians. These apprentices are in the employ of 24 contractors spread over 14 communities. Fond du Lac, Manitowoc, Sheboygan and Watertown now have local ordinances requiring apprentice training under formal contracts. In the remaining ten communities—Beaver Dam, Cudahy, Fort Atkinson, Janesville, Madison, Malone, Milwaukee, South Milwaukee, Oshkosh and Plymouth—employers and apprentices have voluntarily assumed contracts.

The State Department of Vocational Education, and the Industrial Commission have interested individual contractors in the plan and they are trying it out. In the four towns where these young men are indentured, as interest grew, the local contractors secured the backing of their local associations and worked up ordinances requiring electrician apprentices. A proposed state law, strongly backed by the Wisconsin Electrical Association and IBEW is the next step toward putting apprentice indenture on a state wide compulsory basis.

Here is what the indenture plan actually involves for the contractor and the apprentice—

1. The employer agrees to hire the apprentice for a minimum of 6,240 hours, during a period of at least four years. Over that time he will provide actual experience at work in the trade and instruction as shall be necessary to de-

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TESTING *motor circuits with a tong type ammeter. The training course includes instruction in all kinds of circuit testing and trouble shooting and the proper methods of connecting and handling electrical instruments.*

MOTOR WINDING *principles and repair methods are covered in sufficient detail to enable the apprentice to detect motor trouble and intelligently handle field repairs. Shop work must be learned on the job.*

CIRCUIT INSTRUCTOR *V. E. Anderson actively promotes the establishment of apprentice indenture in the cities he covers.*

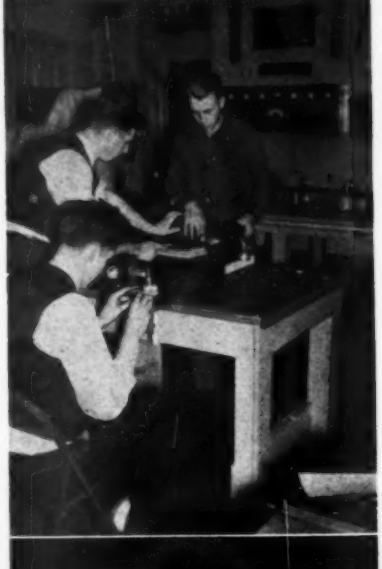
velop the skill of an electrical wireman —at all times under the supervision of a competent mechanic. In addition, the employer agrees to permit the apprentice to attend school four hours per week during the school year, a total of 400 hours on the employer's time.

2. The apprentice, in turn, agrees to perform the work required by his employer at a predetermined sliding scale of wages and to attend school as required in the contract. The wages are fixed by the prevailing journeyman's rate, ranging from 25 per cent during the first half year to 80 per cent during the final half year of the indenture.

Circuit instructors for the apprentice schools, paid jointly by the state and local school board, have been largely responsible for spreading this gospel and building up the interest of contractors. These men are drawn from the industry—many of them former mechanics—and they keep in close touch with contractors in each community on their itinerary. They help organize local contractor groups for apprentice training.

Special electrician apprentice classes, provided jointly by the local school board and the state board, are held in each community one-half day a week during the school year. The classes are conducted by the circuit instructors, who may cover four cities each week.

In Madison, for instance, instructor Floyd O. Briese of the Vocational School, conducts an electrician apprentice class on Wednesday afternoon during the school year. The curriculum includes such elementary topics as local traffic rules, how to get around the city, how to take care of a shop and personal conduct on the customer's premises. Catalogs are studied to learn materials and how to order. The National Electrical Code, State codes and local ordinances are an important part in the course and are referred to periodically throughout the four year term. As the knowledge of the apprentice advances, more complex problems are studied, such as job layouts, instruments, motor control, inter-communication circuits and electrical theory.



The Wisconsin plan has several undisputed advantages. There is a written contract that specifies the responsibility of both parties. No odd job hunters can apply. On the other hand, an unscrupulous concern cannot bolster its gang for a rush season by putting on cheap help under the guise of apprentices.

Also, a definite breadth of training is demanded. The earnest learner knows he won't be turned out as a journeyman, after four years of experience with a hacksaw and stocks at a fixture nipple bench, and expected to compete with skilled labor. Again, the contractor, who hires a "graduate," knows that this youngster has not spent three years of his apprenticeship driving a delivery truck. Trade school classes are an essential part of the scheme. The apprentice learns how to parallel transformer secondarys on the job, but he learns why in school.

There are some disadvantages to the plan, however, that have prevented its wider adoption by Wisconsin electrical contractors. For example, an apprentice indenture amounts to a guarantee of four years steady employment to a man at approximately half a journeyman's wage, and this is a weighty obligation in these jittery days. Again, some shops carry on a specialized line of work that does not permit the breadth of training required in the contract. However, some firms work this out by farming out their apprentices to other shops.

Two other influences are delaying general acceptance. One is the fact that there is an apprentice training program operating in the important city of Milwaukee under IBEW and contractor association sponsorship. This plan fixes the length of training and requires the apprentice to attend school on his own time. Although both Milwaukee contractors and labor admit that the State indenture is superior in many ways, the satisfactory operation of the present set-up has dulled the interest of many in the state system.

The other obstacle is the absence of a compulsory state law. Most Wisconsin contractors are willing to indenture apprentices, providing that their competitors do likewise. They are not willing that contractors who will not assume this responsibility be given the opportunity to hire men carefully trained in other shops. A compulsory state law will be satisfactory, however.

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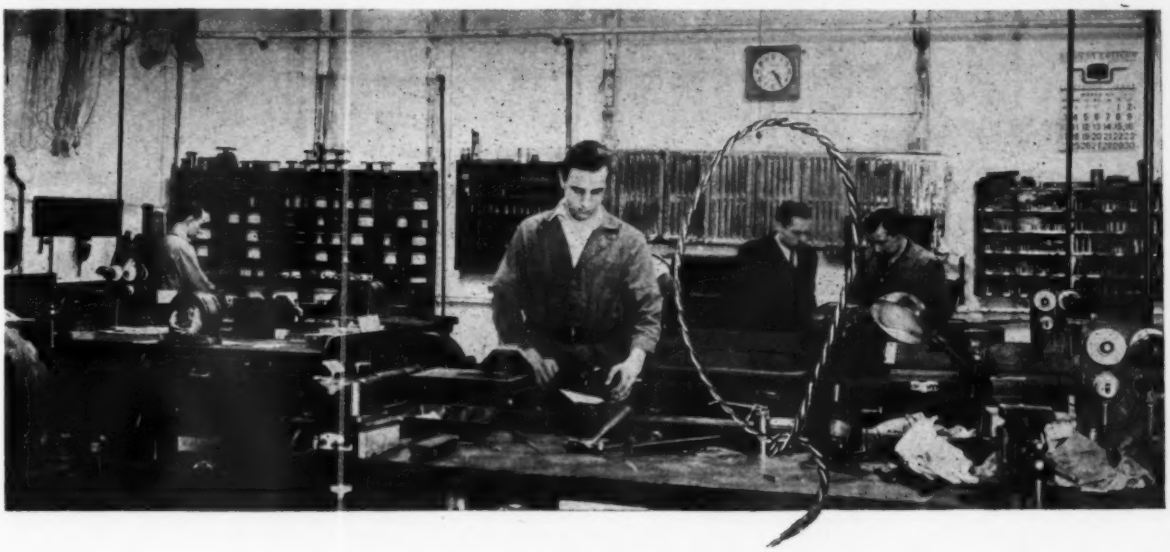
COME OUT OF THE SHOP



Some frank advice to the many motor service-men who still maintain the Fix-It Attitude*

By Earl Whitehorne

THIRTY years ago I had something to do with a motor service shop in New Jersey. We rebuilt motors and generators and fiddled with transformers and control. Since then, of course, a lot of water has passed under the bridge. Shops are bigger, better equipped, more skilled. But I have the feeling from things that I have seen and heard that the attitude of motor shop men is much the same today. It's still a Fix-It business.

Meanwhile what has been happening with American industry? Through an intensive specialization, industrial management has gained great skill in production. But in the process they have become increasingly product-minded. Processes and equipment are growing more intricate and more complicated and with it management has greater need for specialized outside service and help. For example, it wants the advice and aid of experts on power application.

All right, what has the motor shop done meanwhile? It has gone forward in knowledge of motors and control, in the development of its shop equipment and facilities and in the scope and technique of its service. But in spite of all that, it seems to me that it is still a Fix-It business. It offers a passive cooperation. It says—"You get in trouble—we'll get you out."

There are plenty of exceptions, of course. I am speaking of the average attitude of the motor shop industry. I know well enough that there are many successful enterprising modern shops that are making money, because they are headed by men who have pulled their minds out of the shop. They are progressive, alert business executives. But unfortunately the average is still mechanically minded, still waiting for trouble calls. Meanwhile the world is rolling.

For the past ten years manufacturers throughout the country have been deferring maintenance and modernization. Also the stress of the depression has forced them to a rapid mechanization—more motors, more control, more intricate machine tools, with more complicated control. As a result of all this, wiring systems have been outgrown and with this condition have come the evils of low-voltage, poor power factor, impaired efficiency. And meanwhile obsolescence is increasing steadily.

The *American Machinist,* in its periodic survey of the obsolescence of metal-working equipment in this country, reports the number of machines that are over ten years old and therefore way behind the rapid progress that has come in this field. In 1925 they reported an obsolescence of 44 per cent, in 1930 it was 48 per cent. In 1935 it was 65 per cent. Warner & Swasey made a survey last year and found it 67 per cent. So these special-

[Continued on Page 43]

* *An address before the National Industrial Service Association, Chicago.*

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What to Remembe

Fourth in a Series of Check-ups on Wiring Requirements for Various Establishments.

JUST BEGUN—*This battery of high speed presses was put to work before permanent high-bay mercury vapor wiring was completed.*

WORKABLE LIGHT, *like this 30-f.c. mercury-vapor installation, increases efficiency and safety in any shop.*

MODERN machine shops are operated on the three fundamental principles of precision, efficiency and safety. The old idea of mechanics working in dark and uncomfortable quarters at obsolete machines has given way to modern methods. Electrical facilities have been major factors in this advancement, which means better lighting, motorization, control, drives, ventilation and signalling. So machine shops need wiring based on these recognized needs.

Machine tool manufacturers have found ways to build in drives and controls to make machines safer and easier to operate under speedy production methods. It is equally necessary to provide wiring connections that are adequate for frequent reversing and heavy starting, and to insure the positive functioning of sensitive control devices. Moreover, the wiring system should be flexible as to quick changes required in production aisles, either for shifting machines or expansion of the shop area.

When planning to wire a machine shop, several important factors should be kept in mind.

1 A layout of equipment should be prepared and closely checked to make sure that all features requiring electrical connections have been included or at least provided for with spare outlets and circuits.

2 Lighting outlets must be carefully located for the desired general illumination. Local or supplementary lighting at machines should be given detailed study to secure best results, and to permit the installation of wiring and fixtures out of the way of machine operators and moving parts of the machines.

3 All wiring should be installed to withstand whatever abusive conditions prevail, such as vibration, excessive temperatures, water and oil spillage.

4 Control and distribution equipment locations should be planned to minimize mechanical injury. Often special limiting devices, alarms or auxiliary controls will save steps, prevent accidents or machine breakage.

5 Location of underfloor raceways to supply the machine rows will often improve the appearance of modern shops. If this is done, special attention should be given to avoid water and oil traps.

Because there are so many different kinds of machine shops, varying from small job shops to those who engage in large manufacturing operations—only a general list of recommendations can be made. But the acompanying reminder lists can be used over a wide range of machine shops and small manufacturers. Here are the essential items to consider in planning the wiring systems.

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on a Machine Shop Job . . .

HEAVY MACHINING—*New methods of metal planing and milling are dependent upon complex drives and controls for best results*

AUTOMATIC EQUIPMENT *like these lathes with built-in drives and controls, requires wiring that will assure positive operations for sensitive controls*

CHECK LIST FOR MACHINE SHOPS

Air Compressors
Bending and Straightening Machines
Blowers
Blue Printing Machines
Bolt and Rivet Clippers
Boring Mills
Brakes
Braziers
Buffers
Chain Makers
Shipping Hammers
Conveyors
Cranes
Drill Jacks
Drill Presses
Drills
Electric Pyrometers
Electric Recording Instruments
Electro-plating
Elevators
Extractors
Fans, Ventilating
Fans, Circulating
Filling Machines
Flanging Machines
Forges
Forging Presses
Gear Cutters
Grinders
Grind Stones
Hand Lifting Magnets
Hammers
Heating System
Hoists
Hydraulic Pumps
Lathes
Lifting Magnets
Magnetic Chucks
Magnetic Jacks
Metal Melting Tanks
Milling Machines
Monorails
Oil Pumps
Oil Tempering Baths
Pipe Machines
Planers
Plate Planers
Polishers
Portable Drills
Presses
Punchers
Riveting Machines
Rock and Stone Drills
Rolls
Rubbing Beds
Sand Blasting Machines
Saw Machines
Saws
Screw and Nut Drivers
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Tumbling Barrels
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Oven Furnaces
Sherardizing Ovens
Soldering Irons
Soldering Machines
Soldering Pots
Solution Tanks
Tempering Furnaces

LIGHTING RECOMMENDATIONS

Rough Bench and Machine Work—*10 foot candles*
Medium Bench and Machine Work, Ordinary Automatic Machines, Rough Grinding, Medium Buffing and Polishing—*20 foot candles*
Fine Bench and Machine Work, Fine Automatic Machine Work, Medium Grinding, Fine Buffing and Polishing—*50-100 foot candles*
Extra Fine Bench and Machine Work, Fine Grinding—*100 foot candles*

SIGNALS AND COMMUNICATION

Bells for Start and Stop Signals
Code Calls
Fire Alarm
Buzzer System
Telephones
Time Clocks
Time Stamps

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Check Voltage Drop and Sell Wiring!

Sometime ago, it was suggested here that we need some kind of a gadget to help sell wiring. The light meter demonstrated poor light and opened the door to the sale of I.E.S. lamps. Now, we must have something to demonstrate poor wiring. A simple device to show voltage drop was recommended.

The idea was intriguing — but where was the gadget? Instrument manufacturers have been working on it. Several models have been produced—naturally experimental, bulky and expensive. Meanwhile, some power company men have had serious qualms, lest any check up of voltage lead to misunderstanding and embarrassments over bad voltage on secondaries.

Now comes this story from a wholesaler's salesman in Cleveland. While the rest of us are talking about the problem, he has found out how to do the trick. He got a simple pasteboard attachment for his light meter and checks voltage drop and sells wiring and lighting equipment. He has shown the industry how it can be done!

By J. W. Wolf
Lighting Specialist, Allen Electric Company, Cleveland

YOU ask me to tell the story of how I sell wiring and light by checking voltage drop. I will be glad to and the best way is to list a few experiences that show how I use my little gadget and what happens.

But first a word about the gadget. It is a simple device, just a small watt carbon lamp in a pasteboard cylinder that fits over the top of an ordinary light meter. By an easy adjustment, the indicator is made to read correctly with the particular light meter with which it is to be used. A regular type voltmeter is needed to make this initial adjustment, and the meter is set so that it reads 20 foot-candles when the voltage is 115 volts. Thereafter, voltages in the 110-130-volt range can be easily determined by merely holding the indicator over the light meter, and plugging it in on the circuit to be checked. If, for example, the circuit voltage is 119, the light meter indicates 25 foot-candles—as shown on the conversion scale on the indicator.

When the sight meter was new, of course, a lighting man could get any customer's interest by using the meter and explaining its application. Due to much publicity and many demonstrations by the lamp companies, and lighting people, the meter has become an everyday affair. But when I approach a customer with the voltage indicator and use it in connection with a sight meter, it always attracts interest. Here's what happens—

1 One of our contractor customers, the Berg Electric Company, asked me to go with him to the Angell Nail & Chaplet Company to lay out a lighting job. I

UMI

plugged in the voltage indicator and read 103. Berg said I was wrong. He brought a regular volt meter and found 103.

He explained to the owners, with the result that new transformers were installed and new feeders run from the transformer to the lighting panel. This brought the voltage at the panel to 116, with corresponding increase in the light output. Later a new addition was put on, and No. 12 was used on branch circuits up to 50 ft. and No. 10 for longer ones.

2 The Ferro Machine & Foundry Company called us to recommend some lighting. I tested the voltage at 107, and when lighting was turned on, it dropped to 103. They had been using 120 volt lamps. Result: Wiring changed and proper voltage lamps installed.

3 In Bellevue, Ohio, I checked the voltage in a public library and found 104, when a few lights were burning. Part of the building had just been rewired with No. 14 and a two-wire service at 110 volts. I explained the matter to the chairman of the committee.

Results: New transformer, new feeders, new panel, old portion rewired and new portion changed to No. 10 wire. Sold new fixtures using 1500 watt lamps—average 25 footcandles.

4 The Style Center, at Elyria, had been solicited many times for new lighting, but no one could get to first base. Mr. Schultz, of the Ohio Public Service Company, asked me to tackle the proposition. I asked permission to read the voltage and found the voltage down to 107. The owner, showed an interest, and I explained the loss in heat due to small wires, also the resulting loss in light. He asked for suggestions as to improving the entire situation.

I sent him two Curtis Edge Ray indirect fixtures and had electrical contractors install these with 750 watt, 105 volt lamps, which was the same as socket voltage. I then got the contractor to give me an estimate for pulling larger wires into the present feeder pipes—also larger wires from the distributing panel to the branch panels. We could not change the size of the branch circuit wires due to the construction of the drop ceiling. We moved the fixture outlets three feet in from each side, to give better distribution. I then gave the owner a price of $900.00 for the entire job—new wiring, new fixtures, new bi-post 750 watt lamps. He accepted and the new job is now in.

5 At the High School at Carrollton, Ohio, I found the voltage to be 105 on one side of the line and 109 on the other. The engineer said my indicator and meter were off. When he used a voltmeter, the figures checked exactly. I asked what voltage lamps they were using. He told me 115 volt. However, I asked them to climb up and let me see a couple of the bulbs, and I found them 125 volts. I explained the effect of high voltage lamps on low voltage current.

So the transformer, located 900 ft. from the building, was increased in size. New secondary wires were run to the service entrance switch. New wires were pulled to branch cabinets. New lamps of 115 volts were installed. You can imagine the difference.

6 The Cleveland Screw Machine Products Co. asked for lighting information. I tested the voltage at different points with the indicator and it varied from 105 to 109. They started rewiring a portion at a time, and are using proper lamps in their present fixtures.

7 At the McKinnon Iron Works, Ashtabula Harbor, they ordered two new fixtures and 500 watt bulbs. They then complained of poor lighting. I went out on the job, tested with voltage indicator and sight meter, and found 113 volts when no load was on. It dropped to 109, when one 500 watt lamp was turned on, and dropped to 104 when the second 500 watt lamp was turned on. The circuits were 120 ft. long and No. 14 wire.

The customer would not rewire, and so to give him proper footcandles, we furnished 500 watt 105 volt lamps. We explained to him why it would be cheaper to rewire than to waste money heating up the wires. Some day he may change.

8 One of our lamp contract customers, The Bartlett & Snow Company, complained of poor office lighting. They use about 60 diffusing opal globes. I checked their voltage with my indicator at 3 P.M. and found it 109 volts. At 7 P.M. I found it to be 121 volts. They were using 115 volt lamps. They had a new transformer put in, so that when the machinery is running during the day, there is very little drop, and after the machines are stopped—very little surge.

9 Last winter, I was asked by a fixture manufacturer's representative to visit the Blepp-Coombs Sporting Goods, Inc., where he had sold some fixtures a few months before. The people were now complaining about the light they were getting. I tested with my indicator and meter and found it to be 103. I thought that possibly my meter was off, so the next day I got another meter and indicator, but again found the voltage at 103. We reported the matter to the Illuminating Company, who found that transformer trouble outside caused part of the low voltage, and small circuit wire was accountable for a balance. They intend to rewire the premises.

Now what is the result of these changes? The electrical contractor gets a wiring job. The electrical wholesaler sells the material. The power company gets a larger consumption. The lamp agent sells the right lamps and often larger ones. The fixture people get some new business. Labor benefits from doing the re-wiring and hanging the fixtures. But over all, the customer gets the light he needs and wants and corrects the trouble that has been worrying him. And it is all done because I use the little gadget to demonstrate the local voltage drop and so get a chance to tell the consumer what has really caused the trouble.

HIS GADGET—*Here's proof that the correction of voltage drop can be sold. With this little cylinder and his light meter J. W. Wolf checks the voltage wherever he goes. And where its low he sells more wiring.*

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Selling *Light* to the Bakery

From the large wholesale plant to the small neighborhood shop, bakeries offer the contractor an opportunity to sell better lighting. If he will approach his prospect with specific suggestions he can get the business.

There are just two things to do —Study this article. It presents practical data for lighting all departments of the modern bakery. Then make a list of the bakeries in your town. Tell them the story of better lighting.

This is the fourth of a series of practical recommendations on the application of light to meet the needs of specific industrial and commercial establishments.

IN THE survey of lighting in industry, prepared in 1933 and '34 by the Illuminating Engineering Society, the 15,684 bakeries in the United States showed an average lighting intensity of 1.24 foot candles. At that time, 32.1 per cent of the total were using obsolete reflecting equipment. The average age of lighting equipment was 7½ years.

That potential market has increased in recent years. A small percentage of these bakeries have purchased new lighting equipment, but not enough to keep up with normal obsolescence. Further, during the last five years, public consciousness of lighting has developed to a new high and recognized illumination standards have increased 100 to 200 per cent.

Although baking processes require few critical seeing tasks, there are three lines along which the contractor can develop his sales approach and the bakers interest.

1. Lighting for increased production, a better product, and better "working conditions."

2. Lighting for cleanliness and brighter appearance.

3. Lighting for sales.

Modern lighting has a history of increased production in hundreds of instances in industry. The bakery is no exception. Easier seeing means quicker and more accurate blending and weighing, better uniformity, less waste and spoilage. It also creates more cheerful surroundings and better working conditions, a point of growing importance in these days of labor unrest.

The trend in all food products preparation is toward an open plant, a show place visible to the customer, with public inspection invited. This policy, combined with public demand for the highest standards of cleanliness in the preparation of its food products, calls for lighting installations with good illumination levels and a minimum of glare.

Where a retail store is maintained at the bakery, there is, of course, a further opportunity for better light sales. For the relationship between light and sales is already well known in the retailing field. Here lighting intensities for window light and store interiors, will be largely determined by the location, the neighboring stores and the general character of the trade. The recommendations in this article will line up with present day practice on Main Street of the smaller city or the big city neighborhood shopping centers.

In order to approach the lighting problem from the baker's standpoint, this analysis follows the processes in an average small bake shop whose staple line is bread and rolls. The product is sold through a retail store and neighborhood delivery wagons.

Storage room—Flour, sugar and other baking ingredients are stored and handled in a cool, dry room. Containers are usually large bags or barrels readily identified and handled under comparatively low lighting intensities. The lighting system should be designed to provide general illumination of eight to ten foot candles. If boxes or barrels are opened in the storage space, dust tight enclosing glass units are recommended.

Blending and mixing—Flour and other dry ingredients are mixed and blended before water is added. Although sometimes handled in the storage space or shop, many bakeries have a blending room for this operation. Because of the dust conditions prevailing, it is important that lighting equipment in this area be approved for use in Class II hazardous locations. No critical seeing tasks are involved, therefore, intensities of 15 foot candles are adequate to provide general illumination. The installation of lighting units in such areas should permit convenient cleaning and maintenance.

[Continued on Page 60]

Pictorial index for the table of intensities and equipment.

KEY TO INTENSITIES AND EQUIPMENT

	FOOT CANDLES	TYPE OF UNIT	
Flour and ingredient storage	10	Dust tight RLM	A
Dumping, blending and sifting	15	Dust tight RLM	A
Mixing	15	Glassteel	B
Fermentation	10	Glassteel	B
Proofing, dividing, moulding	15	Glassteel	B
Wrapping	25	Enclosing globe	C
Retail sales	25	Semi indirect	D
Counter cabinets	50	Lumiline strip	E

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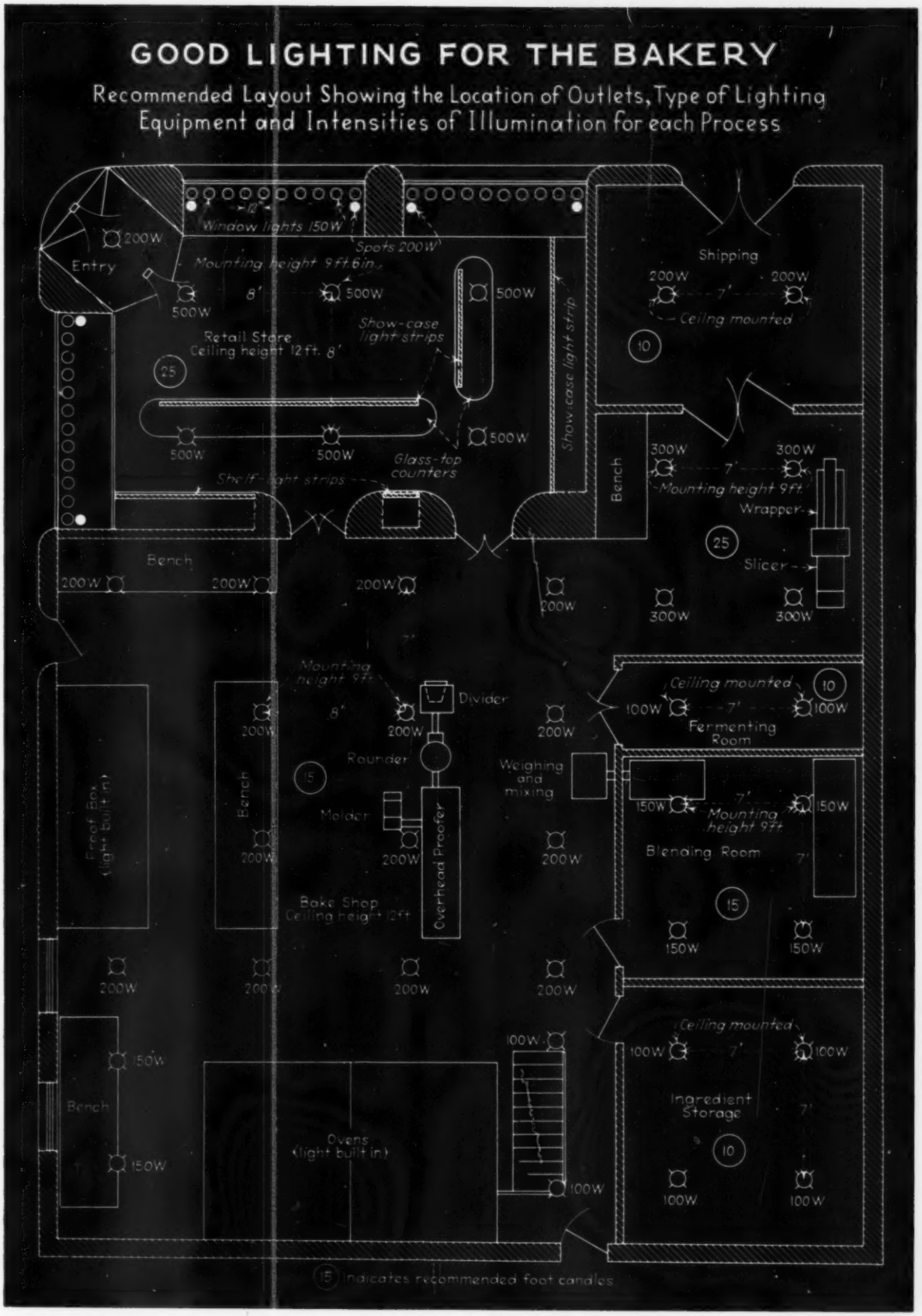
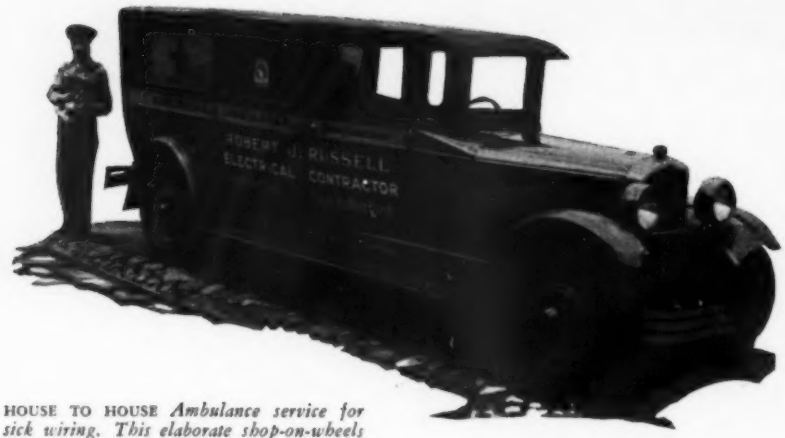
GOOD LIGHTING FOR THE BAKERY

Recommended Layout Showing the Location of Outlets, Type of Lighting Equipment and Intensities of Illumination for each Process





HOUSE TO HOUSE *Ambulance service for sick wiring. This elaborate shop-on-wheels serves several New Jersey communities.*

Russell's Electrical Ambulance Supplies

Wire and armored cable
Screws, bolts, lead shields
Wiring devices and plates
Fixture parts and wire
Pull and canopy switches
Sockets, husks, shadeholders
Lamps and fuses
Flexible cords and attachments
Transformers, bells, buzzers, push buttons
Iron cords, appliance repair parts.

Succor for Sick Wiring

Russell's "Electrical Ambulance" Serves New Jersey Boroughs

BERGEN COUNTY, New Jersey has so many adjoining villages and boroughs that only the old-time residents can name them for more than five miles around. This makes business complicated for electrical contractors, and likewise for customers who want quick service.

Because of this situation Robert J. Russell, electrical contractor, in the town of East Rutherford, saw a chance to do something different. He needed a shop-on-wheels for serving people in all these communities. But to keep it busy, required putting it over with the public. An idea was needed.

The idea came to Russell while chauffeuring back to his town in a "used" ambulance he had just purchased from a neighboring town. That ambulance attracted attention. It was given the right-of-way. Here were courtesies which represented a new experience for an electrical contractor. So why not leave this ambulance as is, thought Russell, and call it an "Electrical Ambulance" instead of converting it into a conventional shop-on-weels.

Police officials were consulted. The idea was ok'd except for a request that the Red Cross be changed. So a painter put on a light blue body finish, with a cream-colored band and glossy black upper trim, before Russell's name and the "Electrical Ambulance" lettering was applied. The crosses were painted blue.

COMPLETE STOCKS *of needed supplies and tools are carried, based on past experience. Call-backs to the office are avoided.*

MORNING ORDERS—*Robert J. Russell lines up the calls for another day. Call-ins from jobs catch emergency orders during the day.*

When the shop appeared on the streets people asked, "What is this Electrical Ambulance?" Russell told them it was used to take care of sick electrical systems. And that is exactly what is happening in seven or eight adjoining communities. They use no gong or siren, yet people are always attracted by this novel service idea. It keeps Russell's service before the public, and three telephone listings make it easy to find his name.

This shop-on-wheels ambulance is used to handle all sorts of small orders which are routed out each morning. Once on its way, the crew phones during the day, as the ambulance is moved from one job to another, and picks up emergency calls. Quite a few real estate firms and general contractors engaged in alteration or repair work are Russell's steady customers, so with all sorts of wiring systems and fixtures to revamp and repair, the daily routine calls for a good assortment of "rolling stock." There are boxes and drawers in the ambulance filled with tools and the odds and ends of electrical parts and supplies to meet all emergencies.

Hand tools are kept in two metal kits which are taken into the house. Customers don't like to see mechanics running back and forth to the street every time another tool is needed.

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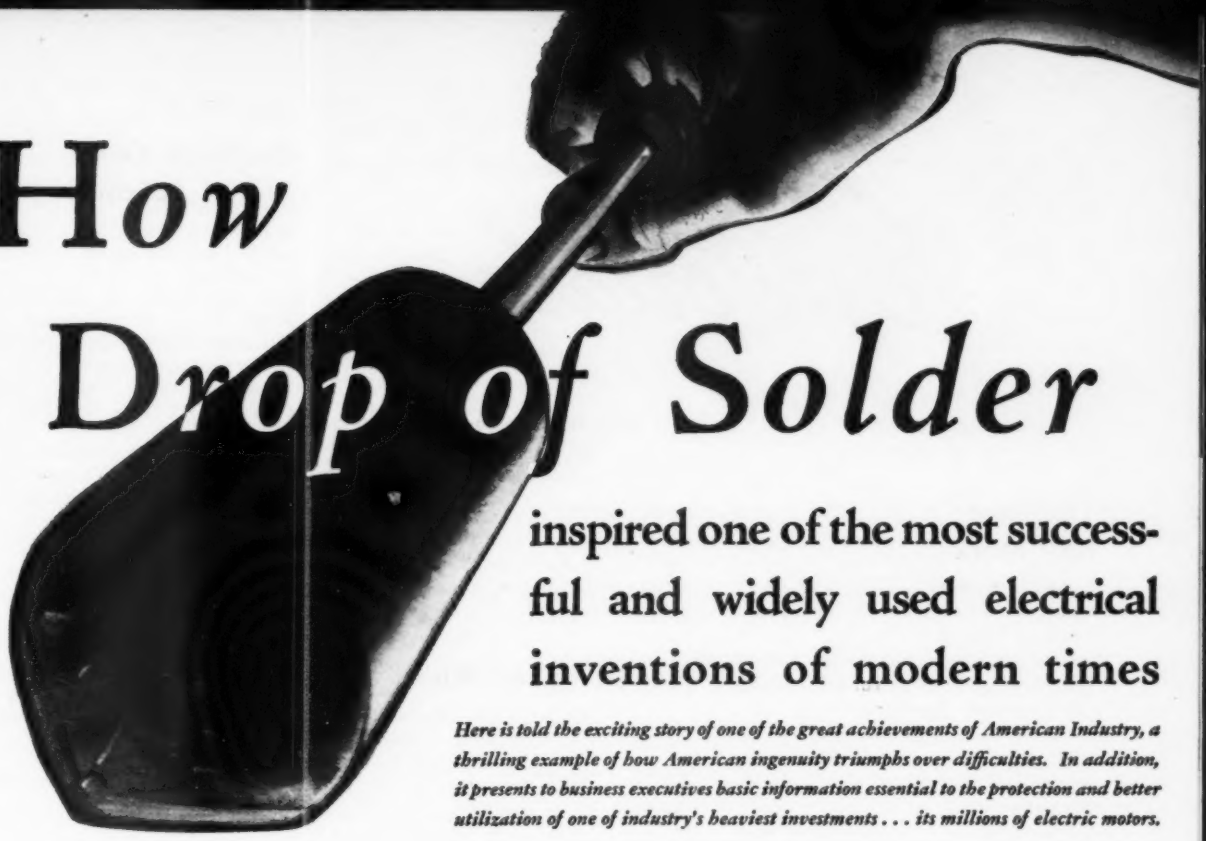
How a Drop of Solder



inspired one of the most successful and widely used electrical inventions of modern times

Here is told the exciting story of one of the great achievements of American Industry, a thrilling example of how American ingenuity triumphs over difficulties. In addition, it presents to business executives basic information essential to the protection and better utilization of one of industry's heaviest investments . . . its millions of electric motors.

An electric motor does not know when to quit. It will do anything under high heaven to move the load put upon it. Even when the load becomes too great, the motor still strains and struggles, drawing current from the line until its windings char and burn, not only destroying itself but disorganizing the operations in which it plays a part.

For more than a quarter of a century the world's engineers wrestled with the problem of a device that would let a motor work up to its limit, but not a step beyond; a device that would protect but would not stop the motor on mere temporary and harmless overloads. Many were the answers through the years, but they were clumsy, expensive, inaccurate or undependable.

Then, one day, a young designing engineer watched a bit of solder melt . . . and freeze again. That gave him an idea. He looked for a metal or an alloy of metals that would have an unvarying melting point, that would hold like a bulldog until that point was reached—and would then suddenly *let go!*

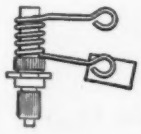
At last it was found . . . and then a group of Cutler-Hammer engineers worked out its application. They took a tiny bar of metal an inch long, an eighth in diameter. They made a sheath for it, scarcely large enough to permit the bar to rotate inside it. They dipped the end of the bar in the melted alloy, hastily pushed the bar into its sheath. The alloy *froze,* clamping bar to sheath immovably. When heated the bar would rotate. When cooled, it was rigid.

This was the birth of the now famous Cutler-Hammer Eutectic Alloy Thermal Overload Relay . . . in principle just as it is used today to protect millions upon millions of electric motors . . . nearly 2 million in American homes on refrigerators and other domestic appliances, and several millions more in America's factories. But this was only a beginning. Between the principle revealed and a practical, dependable device capable of low cost mass production was a great gulf . . . a gap Cutler-Hammer engineers, alone, have so far been able to span.

The story of the refinement and perfection of the Cutler-Hammer Thermal Overload Relay would require a book. The story of the attempts to imitate it, to duplicate it, to emulate it would fill another. The story of its manufacture, the tests and inspections it must undergo would fill a third. As a matter of fact, the success of the Cutler-Hammer Thermal Overload Relay—and it is a success almost without counterpart in the history of Motor Control—is as much a tribute to modern laboratory-controlled manufacturing as it is to the engineering genius that conceived the principle.

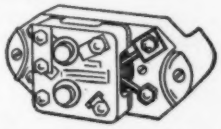
The C-H Eutectic Alloy Unit

When you think how other methods of constructing a dependable overload device have failed, how *this* capsule mechanism accurately reflects the changing conditions in the motor's windings, and assures the safety of untold millions of dollars of motors and machines and products and profits, you begin to see what an achievement this was, and one reason why Cutler-Hammer Motor Control is respected beyond all others wherever electric motors are used. CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers,* 1306 St. Paul Ave., Milwaukee, Wis.

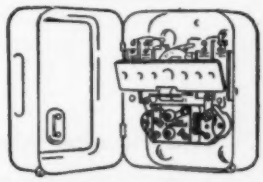


Heater Coil Melts Eutectic Alloy

This coil carries the current going to the motor and is so selected that the heating produced is exactly proportional to heating within the windings of electric motor itself. It arrives at the temperature which melts the C-H eutectic alloy at the very point where heating within the motor becomes dangerous to the motor windings. When this "drop of solder" melts, it allows one part of the unit to turn, which through a mechanical arrangement opens the circuit, stopping the motor. A simple "reset" button restores service . . . no parts to replace . . . no adjustments needed.



C-H Eutectic Alloy Thermal Overload Relay Assembly



Position of overload relay in a typical unit of Cutler-Hammer Motor Control

CUTLER-HAMMER
MOTOR CONTROL
C-H

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Editorials

Earl Whitehorne, Editor

This New REA Money

Another hundred million dollars new money has been given to REA to be spent on extending electric service to the farmer. That means some part of 100,000 more miles of rural lines with close to three farms per mile. And for every dollar spent for transmission lines there will be another dollar spent for wiring, appliances and lamps sold to the new rural users.

No contractor can ignore this market now—even though he may not wish to participate. But for many others it offers big and immediate opportunity. Have you figured out your place in it?

OK—Give Them the Law

NECA is worried over the extent to which contractors and suppliers are dabbling in special deals that give unfair price advantage to individuals and upset fair trading in the local market. The government says that they violate the Robinson-Patman Act and plans are afoot for making a test.

Earl Peak, in recent California speeches, gave notice that NECA is going to prosecute violators. He said they are going to run down some of the men who take an unearned wholesale discount and use it against competitors on wiring jobs. It should be done.

The Plumber Makes It Pay

The plumbing and heating industry doesn't neglect its repair business. Why should the electrical contractor?

Repair work offers a chance to get into the home, the factory, the hotel, the commercial building—as a friend. Then the plant can be examined and new sales opportunities can be spotted. Since "getting in" is the first step in all selling, don't neglect the repair business. It opens the door and a lot of time, thought and energy is saved.

Plan It Big and Wide

From coast to coast the Adequate Wiring idea is rolling. Meetings everywhere. Cities organizing local programs and qualifying to certify houses. Orders for AW promotional material pouring in to national headquarters. Then what?

The test comes when the advertising is out and the selling starts—house to house—day after day. Some cities are thinking now only of new houses. But that reduces the market by 90 per cent. Why wait for new houses that are coming slow? This is the toughest selling job the industry has ever tackled, but it offers the richest field. Almost every building is a prospect and the program should be planned for several years of steady build-up.

A Machine Wiring Code?

Modern machines are mounting such a complicated array of built-in motors, controllers, instruments and auxiliaries that detailed wiring standards are needed. Recently the Machine Tool Electrification Forum recommended complete standards that would provide for adequate and proper wiring of all types of tools.

Code rules now applying to motor branch circuits and protection are complex and such a development by machine manufacturers will be welcome to inspection authorities. Even though large machines are now partially wired at the factory, contractors or plant forces must complete the job. If all parties work to the same standards, there will be better results for all concerned.

Confused Over Outlet Spacings

It's like the popular song "Nice work if you can get it." We mean the unfortunate yet rather general misconstruction of a new rule in the 1937 Code. This rule is Section 2110 relating to the spacing of receptacles in dwellings. Recently a local electrical bulletin carried an announcement that the city's electrical inspector would enforce the 1937 Code's requirement for a receptacle for each ten linear feet of baseboard. It stated that the local league's Red Seal standards required a convenience outlet for each 12 linear feet, but that the city required ten.

Regardless of desire for a closer spacing of convenience outlets, a careful reading of Section 2110 clearly shows that the intent is not to require an outlet every 10 feet. The minimum straight-line spacing between outlets along a baseboard would actually be 20 feet. The Code has raised false hopes in the minds of some well-meaning comfort wiring boosters.

Another E Pluribus Getsum Job

Ever since the industry wore three cornered pants and held itself together with a safety pin, there has been a row over motor resale discounts. And the situation has not yet been straightened out. But a lot of motor shops have quit trying to sell many new motors. They just sell rebuilt machines.

That is not right. Rebuilt motors have their place in the market. But there should be no impediment to the motor shop selling its factory customer the right thing always.

The motor shop men should decide what they are entitled to, build up their case and together go after it. When they show that what they want is right for industry—they will get it.

And We'll Mow 'Em Down

Tired husbands can take heart. Relief from summer drudgery is in sight. A lawn mower martyr in Ossining recently went on a sit down strike, refused to ruin his golf muscles any longer by pushing a lawn mower. But the grass kept growing.

His wife called in an expert who hooked a motor on it. A contractor installed some plug-ins about the lawn. And Friend Meal-Ticket now just fol-

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lows it around—and whistles. The next step, of course, will be a radio to provide music. So here comes outdoor wiring in a big way. It's a great business.

An Idea Beats a Price

There is one sure cure for price competition—ideas. Interest the customer in the features of his wiring that he will enjoy and he stops talking about cost. That's where so many jobs are ruined.

Has he a slightly lower bid? Turn the talk to added outlets, remote control, a master switch, generous wire size. Interest him in the fact that these things you include are worth more—like extra gadgets on the new car. Make him want 'em and the trick is turned.

It's Catching

Good missionary work pays off in big chunks now and then. For example, in Philadelphia, the Electrical Association has a new convert to adequate wiring. A builder there has 35 houses under construction now. He recently advised the Association that he is sold on plenty of service capacity. Each of these new houses is to have a 60-amp. service that will be played up as a sales feature. Who says there is no human interest in wiring details?

Sell the builders on the idea and get them talking it, and it won't be long till John and Mary will be taking notice. Ideas are catching.

Sell With This Easy Money

The pocket nerve is the most sensitive irritable branch circuit in the human body. Let a salesman appear and it falls into a flurry-shouting "Help! Murder! Police!"

On the other hand, the slightest exposure to a bargain sets this pocket nerve to purring. The electrical industry found this out some time ago. For the thing that moved the market for vacuum cleaners, clothes washers, radio, refrigerators, was easy payments.

And now EHFA offers to finance wiring. This is great news! Talk it over in your town at once. Ask your power company to tie in. Quit buckin' the pocket nerve.

Magic for School Ma'am

Now comes magic to the school house—a new equipment combining radio, phonograph, chimes. public address and inter-communication. It's all done up in a single package. A contractor can sell it. A contractor can install it. Just one more piece of opportunity in this business.

It is about time we all woke up to the fact that wiring in itself has become the small part of our function. All the new things that need wiring now look to us for service. The job is growing month by month and the opportunity along with it—if we keep up with it.

Let 'Em All Help

Say what you will—this is a great time to be an electrical contractor. Manufacturers, wholesalers, power companies, the Government all want to help us get more business—make more money.

Just check "em over." National promotion programs are running on electric ranges and water heaters, laundry equipment, modern kitchen, Better Light-Better Sight, adequate wiring, rural electrification, housing, industrial modernization, easy payment financing for building, wiring, appliances. All of it makes more wiring, more sales. But too many contractors have their eyes and ears tight shut to it!

Back Talk

Wants Rural Inspection

To the Editor—"We are located in the center of the REA activity, in fact the farmer is our next door neighbor. We have heard all the arguments possible from many angles. Your article "How About Farm Wiring?" in the June issue 'hit the nail on the head' and was really interesting. Your editorials also, are appreciated.

"Here is a point which has been bothering me since 'way back when'—when, if ever, are we going to have code enforcement in our state, especially in small towns of five thousand population or smaller? The wiring in some instances is disgusting, and, I insist to my dying day, hazardous! Our local problem has not been doing the wiring so much as selling a good job.

Trusting you will keep up the old battle against poor workmanship and unfair price cutting,

U. C. Nolte,
Belmond, Iowa.

In our minds, you are right beyond question, for safety is as important in the country as in town. And the only way to insure safety in rural wiring is to have the work done right. And the only way to insure it being right in this benighted world is to set up the Code and enforce it. This is now established on rural systems financed by REA. Contractors should work to get it established also in areas served by power companies.

He Wants the "Gadget"

To the Editor—"Some time ago I read one of your editorials regarding the necessity of a 'gadget' for selling rewiring jobs, and agreed with you 100 per cent. Yesterday, I listened to Mr. Tait, field man for the Bureau of Adequate Wiring who spoke to an industry group here in Youngstown. I was surprised that he did not have with him, or did not know of any such 'gadget'."

I firmly believe that there is a very great need for some device that will show in layman's language the losses that are occurring in any given wiring installation. My experience with light meters and with radio tube testing equipment is largely responsible for this opinion.

I am anxious to secure any information that you may have regarding the development of such a device. Is there such a device now on the market? Who makes it? How much cost? If none are available, what company is doing developing work? When will their product be available?

J. B. Conklin, Sr., Vice President
Peterson-Webster Electric Co.,
Youngstown, Ohio.

The gadget is coming, sure. See on page 14 the story of one man who is already using one in a simple form. Meanwhile, a further development is being tried out in several cities in the southeast. This should be ready to announce and available for use before long. Also, several instrument manufacturers are working on more elaborate models. The gadget is coming!

Why Inspection Fees?

To the Editor—"Kindly have the following questions answered in the next issue of your magazine—

1. What right has any organization of the insurance companies to charge for electrical inspections?
2. If there was no charge for electrical inspections, would not the insurance companies benefit by the increased number of applications for the inspection of electrical installations?

Vincent A. Raia,
Brooklyn, N. Y.

1. Shortly after electricity began to be applied to lighting buildings, it was found that fires were occurring. Electrical inspections were instituted and as the use of electricity was considered a hazard, it was decided to add an increase to the base insurance rate in order to pay for the inspections.

Representatives of the electrical industry, and real estate men both felt that such a charge in the base rate electrical hazard would give electricity a black eye with the public. Therefore, these interests requested the insurance interests to make an individual inspection charge which was to apply to each job and thus be borne by each person having work installed and inspected.

It should also be borne in mind that an insurance policy is a contract between the assured and the insurance company and that where the policy requires an inspection and a certificate from its inspection bureau, the assured is obligated to secure such a certificate in accordance with the regulations of the inspection bureau, which generally require the payment of an inspection fee. Most electrical inspection bureaus use the fee system of paying for the inspections, as in that way the cost is placed upon the person who has the work installed and his neighbors are not asked to help pay that cost.

2. It must be remembered also that a large proportion of the inspections made in this country are a service by the municipalities and not the insurance companies. They charge a fee. Certainly it is fairer to do this than to load the cost of policing wiring installations upon all the tax payers.

We doubt if it would add to the number of inspections to relieve the customer of the inspection fee.

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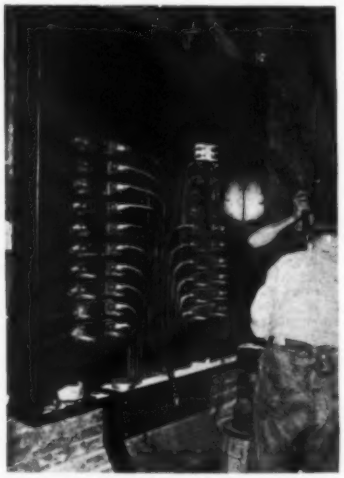
WIRING Methods

GUTTERS FOR GROUPED FEEDERS

In rewiring a furniture factory, the Electric Supply & Construction Company of St. Paul Minn. installed a cut-out cabinet to fuse a number of incoming feeders from the power house. The feeders entered below the floor in tile and were distributed to the panels at the ceiling level. Gutters 30 inches wide and six inches deep were extended from the cabinet down to the tile ducts and up to the ceiling level to carry the 22 feeder cables.



FEEDERS were picked up in a wide gutter from ducts below, fused and extended in a gutter to the ceiling for distribution.

THREE-FOLD PROTECTION

This 200 amp. safety switch and feeder distribution center serves one of several buildings, which Morris Hunter of Richmond, Va., recently re-wired for a local oil and gasoline bulk station. It is installed above record flood crests, out of doors to avoid explosive atmospheres, and housed in a weatherproof over-all enclosure. The principal modernization work took place indoors, and involved installing explosion-proof fittings throughout.

TROUBLE FREE—Distribution equipment placed outdoors solves explosion hazard, and has over-all protection against rain and snow.

The outdoor installation, shown nearing completion did not require explosion proof enclosures, because of its isolated location. After the safety switch and distribution cabinet were made secure to the brick wall, the large weatherproof cabinet was set over them to provide permanent protection against rain and snow. The various feeder conduits extend into hazardous areas from this location, and have sealing fittings at proper locations within the building.

SAVING TIME ON WIRING LAYOUTS

Large blueprints often show such a maze of electrical outlets, plumbing, heating, ventilating and structural details that it becomes tedious and confusing to use these plans on the job for installation purposes. To simplify installation routine, H. H. Mandly of Hartford, Conn., makes new, easy-to-read wiring plans for the job from the existing mechanical drawings.

The new plans are prepared at minimum drafting cost by tracing over the original plans with sheets of carbon and tracing paper laid under the blueprints. After the desired building outlines, electrical symbols and circuiting details have been traced in this manner, the carbon-marked tracing paper can be used successfully for making blueprints of the simplified layout. Moreover, the copied layout, as taken from the mechanical drawings, can be modified before blue printing by making supplementary lead pencil notations upon the tracing paper, or by drawing in further detailed connections which the original drawings may not include.

This tracing method is an alternative to the usual practice of laying tracing paper over blue prints to copy portions of existing plans. The lay-over system is more painstaking unless provisions are made to illuminate the under side of blue prints and make them distinct. With the carbon-tracing method the work is traced out upon the actual drawing. Also, whatever lines or smybols have been so traced clearly shows up, because the lead pencil serves to cancel out the white lines on the original drawing. This leaves no doubt as to which portions of the lay-out have been copied.

ADVANCE MAN'S HANDIWORK

Big jobs are finally the work of many scattered crews, whose efficiency depends upon following a systematic layout. That is where the spotter or layout man comes in. He makes the job simple for the installing gangs.

The accompanying photo shows a two-gang switch fitting which has been spotted and hung up by the layout man in readiness for the conduit crew. It should be noticed that a hole has been drilled in the hollow tile to receive the togglebolt that is already attached to the fitting.

READY FOR PIPE — Advance man spots various fittings to save time for pipe crews.

In wiring a large Philadelphia bakery building, the Utilities Engineering Co. kept one or two men engaged in doing this kind of spotting and layout work ahead of the various installing crews. This switch fitting is to house a combination switch and pilot for one of 58 1/20 h.p. ventilator motors that were mounted in the roof structure.

UMI

"POCKETBOOK PROTECTION"

Retails at 7½¢ in 15 to 30 amp. sizes

with the FUSTAT

Saves time, temper and money

Because of its long time-lag the Fustat does not blow needlessly when motors start on washing machines, refrigerators and such appliances.

Yet the Fustat protects like a fuse against dangerous shorts in flexible cords, grounded sockets, etc., — because it contains a fuse.

And the Fustat makes SAFE protection REMAIN SAFE. Once installed it cannot be replaced by a size too large to protect — and it is practically impossible to bridge it in any way without destroying the Fustat or adapter and thereby clearly showing the user that his protection is gone.

This stops anyone from heedlessly creating a hazard thru the use of something other than the correct size Fustat.

Adds profits — cuts costs for Dealer

The Fustat permits adding more appliances to present circuits without incurring needless blows.

This often saves the expense of a new circuit and helps close a sale.

Fits present fuseholders

Through the use of an inexpensive adapter, that locks in place, the Fustat fits in any standard Edison base fuseholder.

On new jobs you can specify that panels, switches, etc. be equipped with Fustat bases.

Retails at 7½¢

Servicing costs are cut because the Fustat abolishes many "blown fuse" service calls.

Such calls are costly if they must be made during the "guarantee period" — or if the user kicks about paying the full cost where the only work done was to replace a fuse.

On top of this the service man frequently has to be dragged away from more profitable work.

The Fustat offers a common sense way to stop this wasteful evil — it doesn't blow needlessly.

Brings new business to Contractor

If additional circuit capacity is needed, users cannot readily side-step the issue by overloading the circuit at the sacrifice of safety.

The Fustat also offers the Contractor an opportunity to sell Hospitals, Schools, Plants, etc., on replacing old fuses. Responsible executives are quick to see how the Fustat can reduce the risk of fire or damage from electrical causes.

Installing Fustats is profitable business.

Pays Central Station to Promote

The Fustat offers a way to add more appliances or outlets to present circuits — with perfect safety — and without needless blowing of fuses.

Revenue losses are decreased. Users are not annoyed by appliances and lights being needlessly put out of service. This makes for good will and assists load building campaigns.

It's just good business to sell, install and use . . .

The FUSTAT

FOR FULL INFORMATION WRITE TO ANY OF THESE FIRMS

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC CO., Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 277 Broadway, New York City

UMI

Motor Shops

QUICK STATOR TESTS

This simple little device is used for testing stators. A steel plate with a steel shaft and collar, supports a ball-bearing race. The rewound stator is placed end down on the plate on the floor. Current is turned into the coils and if the iob

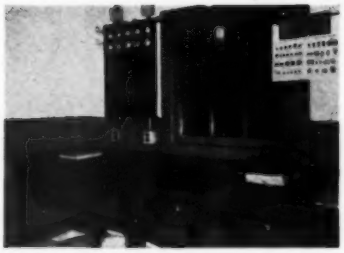
INDUCED MOTION—Ball-bearing on spindle revolves when energized stator shaft is set on floor plate.

is properly connected the outer race of the ball-bearing spins smoothly by induced current. This is used as a preliminary check before assembling a rewound motor by Backstrand Bros. Electric Works, Riverside, Calif.

ISOLATING SMALL REPAIR JOBS

Large shops find it necessary to set up a separate department to handle small repair work and preliminary tests. Here is a neat workbench and testing outfit for small repairs almost ready for use at the Central Armature Works, Inc., of Washington, D. C.

This equipment is in a room on the first floor near the sales counters. Customers who bring in small motors, tools, relays, etc., are waited on without delay or having to roam around the upper shop floors. Furthermore, the tester can discuss all details directly with his customer.



FIRST AID—Up-front testing and repair bench for giving quick service on small repair items, away from the heavy repair department.

The room has stock bins full of miscellaneous parts, for taking care of minor repairs and parts buyers. Motors found to require major repairs, are routed to the shop.

SAVING STEPS AT THE FINISH BENCH

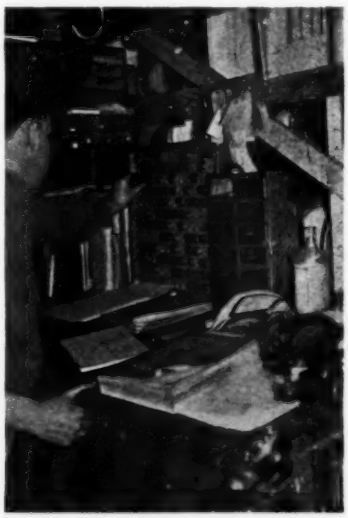
When rewound stators are ready for connecting up lead wires, the winders should have correct sizes of wire available near their connecting benches. They should not have to make extra trips to stock shelves for this material. At the Roland Electrical Co. shop in Baltimore, five commonly used sizes of lead wire are kept on handy payout reels near the finishing bench. The winder reels off the amount of wire needed and snips it without having reels to handle or get in his way.

Standard spools are racked on a column in a vertical tier, with No. 16 wire at the top and the spool of No. 8 at the bottom. The spool brackets consist of pairs of flat iron, equipped with ½-in. conduit spool shafts and fastened with two lag screws to the column. To obtain the correct bracket spacing for the spool width, the column sides are shimmed out with boards.

WINDER CONVENIENCE—Spools of motor lead wire racked near finishing bench save time and steps.

CHECKS IDENTIFY PARTS

Stamped-in numbers on brass checks are used to identify individual motor parts after disassembling in the motor shop of the Porter Electric Company of Minneapolis, Minn. A board at the



BRASS CHECKS with stamped numbers to identify motor parts are conveniently hung on a panel at the order desk ready to be assigned as the jobs are written up.

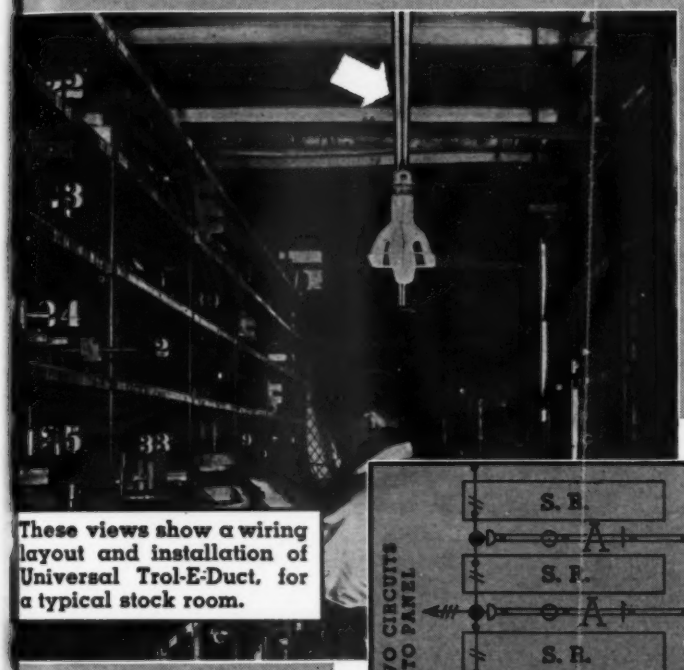
order bench is fitted with 144 numbered pins carrying a group of identical checks on each pin. As the repair order is written up a number is assigned and the equivalent group of checks tied to the job.

When the motor is taken down for repair one of the checks is tied to each part. The checks remain attached to the job until it is ready for return to the customer.

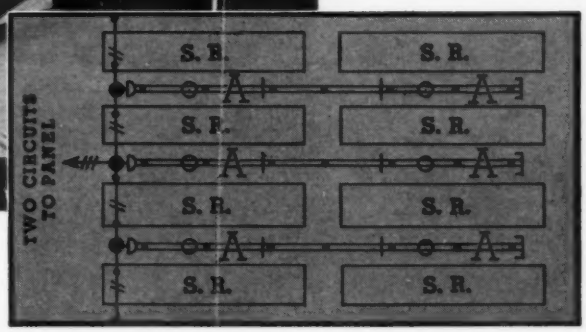
THE *Only* COMPLETE, PREFABRICATED WIRING SYSTEM *that* ANTICIPATES *and Instantly* MEETS *New or Unexpected Electrical Demands*

BULL DOG Trol-E-Duct UNIVERSAL TYPE

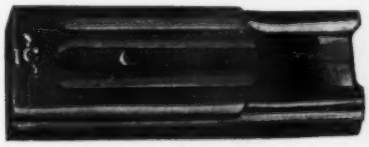
● *Trol-E-Duct* is a complete modern wiring system comprised of steel Duct Sections enclosing two insulated Busbar Conductors together with movable Trolley Collectors and semi-fixed Twist-out Plugs for Current Tap-offs. A complete line of associated fittings consisting of various Couplings, Supporting Hangers, Feed-in End Caps, Elbows, etc., make possible a wiring system to fit the layout of any building.



These views show a wiring layout and installation of Universal Trol-E-Duct, for a typical stock room.



S.R.—Stock Racks A—Lighted Areas



"Trolley Entrance End Cap", catalog No. TEC210.

Universal *Trol-E-Duct* Section, catalog No. D210.

The handy Unit Duct Sections, instantaneous Couplings and snap-on Supporting Hangers make this pre-fabricated Wiring System easy and economical to install . . . and the mobility of the current Tap-off Devices gives a flexibility that will handle all present as well as all possible future electrical demands, without loss of time and frequently without additional investment.

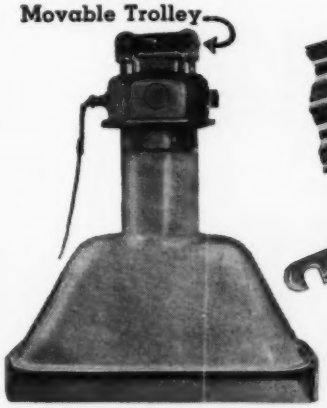
●

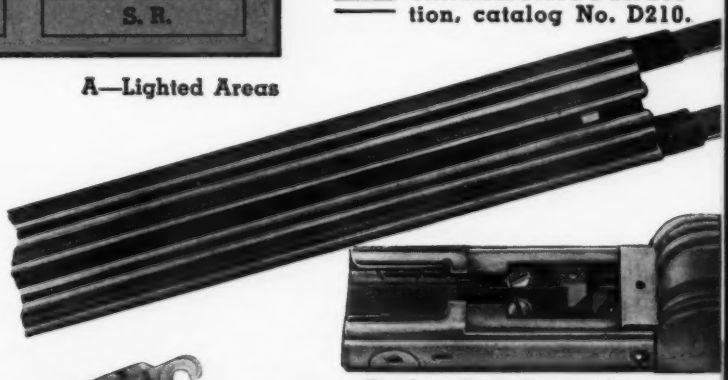
Send for pocket size booklet:—

"How to Mobilize lighting and power outlets with Trol-E-Duct."

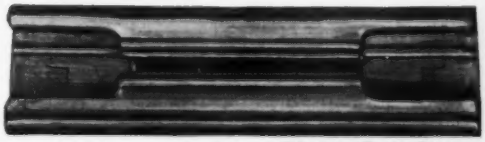
●

BULL DOG Movable Trolley





Feed-in End Cap with cover removed, catalog No. NEP2503



Benjamin Electric Co. Luminaire.

Hangers—catalog No. H210.

Plain Coupling, catalog No. C210.

ADEQUATE WIRING SERVES AND SAVES

BULL DOG ELECTRIC PRODUCTS COMPANY

Pioneers In Flexible Electrical Distribution Systems

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA, TORONTO, ONT.

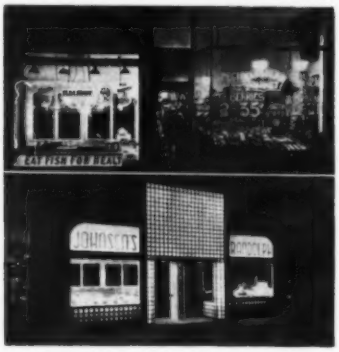
UMI

Better Lighting

A GLASS BLOCK TREATMENT

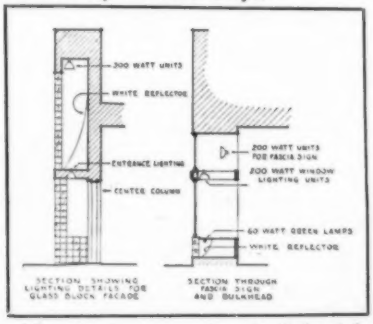
Illuminated glass blocks used about an entrance and show windows create a front that has real sales appeal.

In the picture a white reflecting background for mass grouping over a doorway utilizes six 300-watt lamps.



***BEFORE AND AFTER**—A striking contrast, in old fashioned store fronts modernized with glass blocks.*

The window bulkheads are lighted in green, each employing eight 60-watt lamps. The vertical and horizontal glass block masses in the entrance are lighted in white by 25-watt lamps.


200 WATT UNITS
WHITE REFLECTOR
ENTRANCE LIGHTING
CENTER COLUMN
200 WATT UNITS FOR FASCIA SIGN
200 WATT WINDOW LIGHTING UNITS
60 WATT GREEN LAMPS
WHITE REFLECTOR
SECTION SHOWING LIGHTING DETAILS FOR GLASS BLOCK FACADE
SECTION THROUGH FASCIA SIGN AND BULKHEAD

The fascia name sign is lighted by means of three 200-watt lamps in suitable reflectors which are aimed at the glass. This method was employed because of the limited space behind the glass. Palmer Personal Service, designers and general contractors, collaborated with the Public Service Company of Northern Illinois.

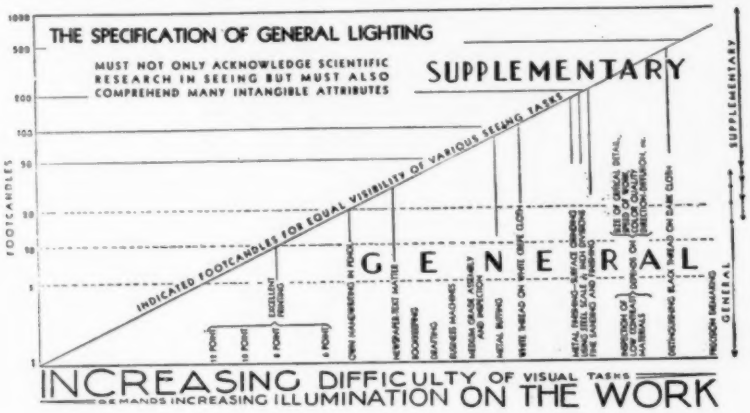
TAILOR-MADE LIGHTING

Tables of recommended foot-candle standards have served in the past as an acceptable guide to current practice and such tables will continue to have that practical advantage. However, as we begin to appreciate the significance of lighting in the broad sense, the need for fitting lighting more definitely to each specific task, where critical seeing is performed, becomes readily apparent.

This means that while certain arbitrary standards of general lighting can be set up, they embrace general conditions only. Beyond this, seeing tasks of varying severity are encountered which require tailor-made lighting.

Here is a sketch which indicates how a great variety of seeing tasks, encountered in the work-world, may be charted, as concerns quantity of light and relative visibility. If the chart were long enough to write in hundreds of conditions on which visibility measurements had been made, an encyclopedia of recommended foot-candles might thus be established for all manner of seeing tasks based on standards of equal visibility or "seeing ease."

The lower area represents the region of practical levels of general illumination at the present time. Where higher levels are indicated by visibility-meter tests, they can be readily supplied by tailor-made lighting over restricted areas.



***DIRECT-INDIRECT**:—Downward punch gives life and spark to merchandise displayed in this Minimax Store at Houston, Texas. Using 300-watt Guth "Direct-Indirects", 42 in. long for 17-ft. ceilings, they are spaced 12 ft., 16 ft. The downward or "plus" lighting through the "Louvre Lens" gives 15 to 18 f.c. Sold by Southern Electric Co.*

BIG SWITCH *Efficiency* *begins* **RIGHT HERE**

and the bigger the switch the more it needs **QUADBREAK** *and* **DUALBREAK** *mechanism!*

Brute strength alone isn't enough in a Safety Switch . . . particularly in a high capacity, heavy duty unit. What really counts is the mechanical design. That's why Colt-Noark Heavy Duty Switches have proved so popular for industrial service where the going is tough. The QUADBREAK and DUALBREAK Mechanisms have been designed with features that really stand for efficient operation . . . long life . . . and absolute safety. Their rugged, roomy cabinets are important . . . but real efficiency begins in the switching mechanism itself. That's why you can sell and install these switches with perfect confidence in their ability to deliver satisfaction. They are available in capacities up to and including 1200 amperes.

QUADBREAK . . . in the 575 Volt Quadbreak Safety Switches, the current is ruptured at four distinct points in each leg. This means less arc . . . a bare minimum of it. And that in turn means longer life, greater safety.

DUALBREAK . . . in the 250 Volt Dualbreak Safety Switches, the current is ruptured twice in each leg. Both Quadbreak and Dualbreak units have Quick-Make and Quick-Break, and Interlocking Covers.

Pacific Coast Representative, The Frank H. Bran Company, San Francisco and Los Angeles

COLT'S PATENT FIRE ARMS MFG. CO., Electrical Division HARTFORD, CONN.

100 Years of Manufacturing Experience is back of every Colt Built Product

COLT-NOARK

SWITCHES · INDUSTRIAL CONTROL EQUIPMENT · FUSES

Boston
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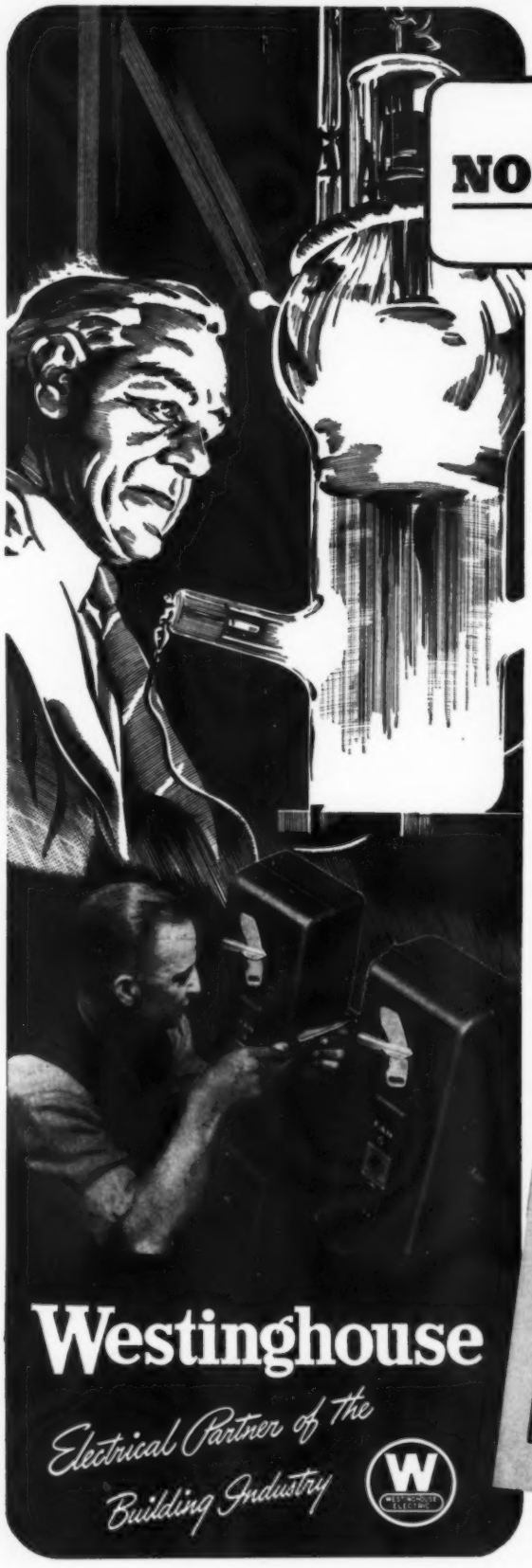


NO GUESSING ALLOWED

Westinghouse "before-and-after" testing protects you all the way

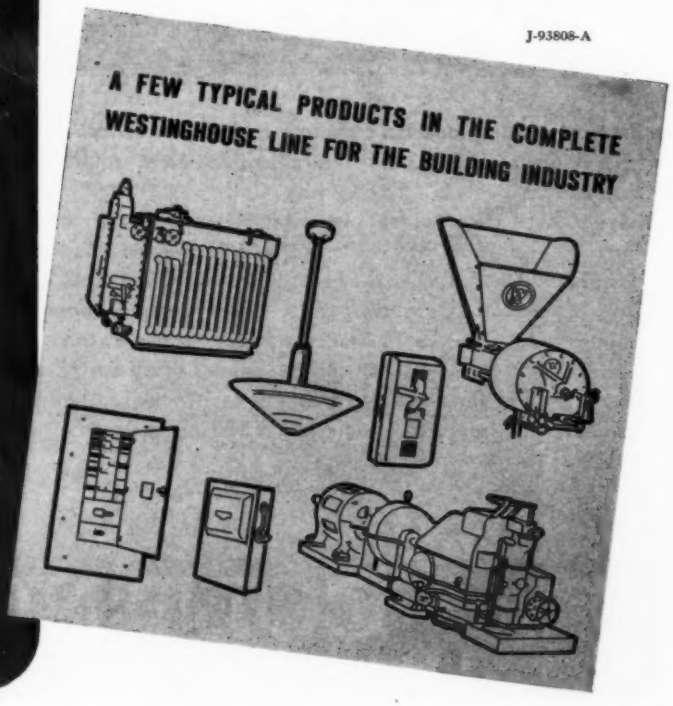
"Results — not excuses" expresses the thoroughness with which Westinghouse Engineers safeguard the performance of Westinghouse products by the most exacting tests and inspection. Nothing is taken for granted. Raw materials are subjected to rigid tests, and this applies throughout the manufacturing process.

After the finished products have undergone tests many times as severe as those they will get in actual service, they are given critical inspection . . . on the job.

No guessing is allowed in the many Westinghouse individual-product testing departments. When Westinghouse products are installed throughout the building you are assured owner satisfaction for many years to come. Call the local Westinghouse office for practical assistance or write Westinghouse Electric & Manufacturing Company, Dept. 7-N, East Pittsburgh, Penna.

Ask for your copy of the Westinghouse Data Book, containing helpful information on electrical products for buildings.

J-93808-A



UMI

Maintenance

TO THESE MEN OUR THANKS!

IN the preparation of this series of Guide Sheets, a number of engineers with specialized knowledge, have been invited to collaborate. Thus each month, these experts of leading manufacturing companies are assisting in the selection and simplification of the material presented in these background reviews of the important electrical equipment used by the modern maintenance man.

For their help in the development of the first six articles of the series, dealing with alternating and direct current motors and control, we acknowledge our appreciation to—

R. C. Moore and George E. Reiff of Allis-Chalmers Mfg. Co.
J. Dixon of Crocker Wheeler Electric Mfg. Co.
L. T. Allis of Fairbanks, Morse & Co.
L. E. Markle of Westinghouse Electric & Mfg. Co.

For photos and diagrams used in these articles we are indebted also to—

Allen Bradley Co.
James G. Biddle Co.
Columbia Electric Mfg. Co.
Cutler Hammer Mfg. Co.
General Electric Company
Ideal Commutator Dresser Co.
The Martindale Electric Co.

This series of articles began in January with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors
2. Direct Current Motors
3. A. C. Motor Maintenance
4. D. C. Motor Maintenance
5. A.C. Motor Starters and Controllers
6. D.C. Motor Starters and Controllers (In this issue)

Coming articles will discuss—

7. Maintenance of Control Equipment
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools and Appliances
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices

CONTROLLERS FOR D.C. MOTORS

—TYPES and APPLICATIONS

THE principal functions of d.c. controllers are (1) to connect the motor to the power lines; (2) to limit the starting current; (3) to permit smooth acceleration; (4) to provide speed control; (5) to disconnect the motor. This article discusses controllers rated up to about 500 hp., in general use in industrial plants, commercial buildings, and institutions. The maintenance of d.c. controllers, and special applications for steel mills, ore bridges, shovels, mine hoists and the like, will be treated here in later issues.

Types of Controllers

The three general types of electric controllers are *manual, semi-magnetic,* and *full magnetic.* The following definitions, which represent standard practice in the United States, have been adopted by the National Electrical Manufacturers Association (NEMA).

Manual type—All basic functions performed by hand. By "basic functions" is usually meant line closing, acceleration, retardation and reversing.

Semi-magnetic type—Part of basic functions performed by electro-magnets, and part by other means.

Full-magnetic type—All basic functions performed by electro-magnets.

These types of controllers may further be divided into two general classes.

1. *Starter*—Designed for accelerating a motor to normal speed in one direction of rotation. If it is designed for starting a motor in either direction or rotation, it is usually designated as a reversing controller.

2. *Speed regulator*—Designed for operating a motor at a given speed either below or above normal.

Manual controllers are across-the-line starters, face-plate starters with self-contained resistors, and drum controllers with separately mounted resistors.

On magnetic controllers, either semi- or full-magnetic, magnetic contactors close or open the motor circuits. The contactors are operated by coils which are energized or de-energized by pilot devices such as pushbuttons or master switches for manual operation, or float switches or thermostats for automatic operation.

EASY DOES IT! *Drum controllers find wide application in crane service.*

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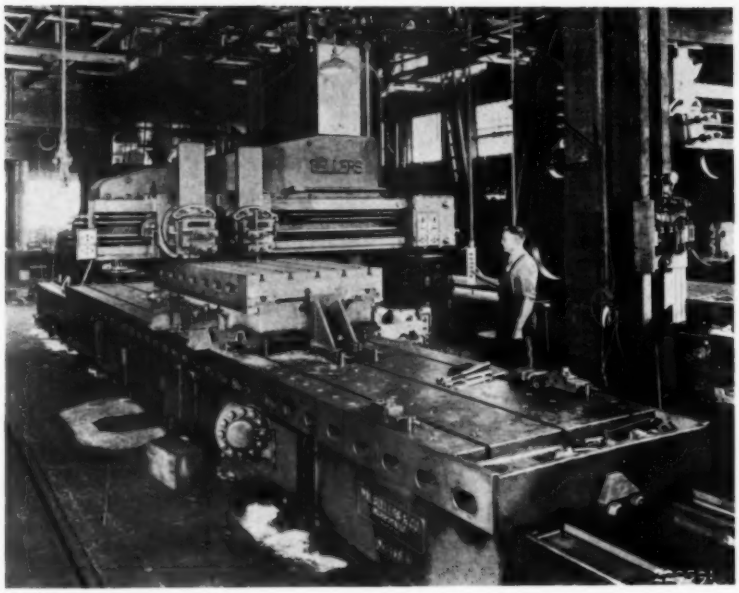


THE WHOLE BUSINESS at his fingertips — A press of the right button, and magnetic control does the rest on this 60-in. planer.

The primary purpose of magnetic controllers is to provide smooth acceleration, retardation, and reversing without damage to the motor. They have the advantage of being operated from one or more remote locations.

Starting and Accelerating

There are two methods of starting d.c. motors—on full voltage and on reduced voltage. The full voltage controller connects the motor directly to power lines. The reduced-voltage controller impresses, at first, less than full line voltage on the armature terminals, and then by one or more steps, increases the voltage at the armature to full line voltage.

Good practice dictates that a d.c. motor over ½ hp. be started by a reduced voltage controller, either manually or magnetically operated. The main consideration is good commutation.

In order to limit current peaks to safe values, most d.c. motors are started with resistance in the armature circuit. This resistance is gradually reduced until it is cut out, and the motor then operates with rated voltage on the armature and maximum field strength, and thus at rated full speed.

Acceleration of d.c. motors is obtained by *manual control*—with face-plate type starter, or drum controllers and resistors; and *magnetic control*—applying the principle of counter electro-motive force, current limit, or definite time.

With the *face-plate type* starter the motor comes up to speed as the operator moves a handle through its normal arc.

The *counter electromotive force* (cemf) principle is the simplest and least expensive form of acceleration for magnetic starters with d.c. motors up to about 10 hp. The acceleration depends upon the increasing value of armature voltage or cemf as the motor accelerates. This cemf is impressed across accelerating contactor coils, which operate contactors that cut out resistors in the armature circuit. Starters of this type usually have not more than three points of acceleration, and are satisfactory where the motor load and line voltage are fairly constant.

Current-limit acceleration requires current relays which are adjusted to close the contacts at a value of current higher than that drawn by the load to be accelerated. The high current peaks hold the current relay contacts open. When the armature current has decreased to a value for which the relay is adjusted, the relay contacts close and energize the coil of the contactor, which in turn cuts out one step of resistance, so that the motor accelerates more. A relay is required for each accelerating contactor. This process is repeated for each point of acceleration. The relay must always be set to accelerate the maximum load.

Definite-time acceleration is most positive. In this method, time element starters cut out the accelerating resistors in a fixed time, regardless of the load. If the motor is heavily overloaded and stalled on the first point, the starting and acceleration are automatically forced on a later point. The overload relay will protect the motor against exceedingly high currents as well as normal overloads. Many different methods are use to obtain the timing feature.

Speed Regulation

Face-plate type starters are made and used for various services, such as starting duty with speed regulation by armature resistance, starting duty with speed regulation by field resistance, and starting duty with speed regulation by both armature and field resistance.

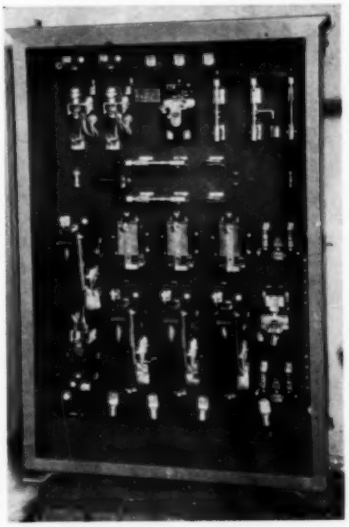
Drum controllers, standard listed types, and resistors can be used for speed regulation by either armature resistance or field resistance, but not a combination of both.

Other methods for regulating speed are variable-voltage or Ward-Leonard system, multi-voltage control, and control by shunting the armature with resistance. Typical applications are for high-speed elevators. Special equipment is required for these methods.

Retardation

Deceleration can be obtained by increasing the resistance in the armature circuit, or in the case of adjustable speed d.c. motor, by reducing resistance in the field circuit.

"Dynamic braking" is applied for quick stopping of shunt and compound motors, and sometimes as a step in reversing service. When the motor circuit is opened, a dynamic braking resistor is instantly connected in parallel with the armature. The shunt field remains energized. The motor, running by inertia, now acts as a generator and



A D.C. RUBBER CALENDAR controller ready for installation. Contactors are equipped with electrical interlocks.

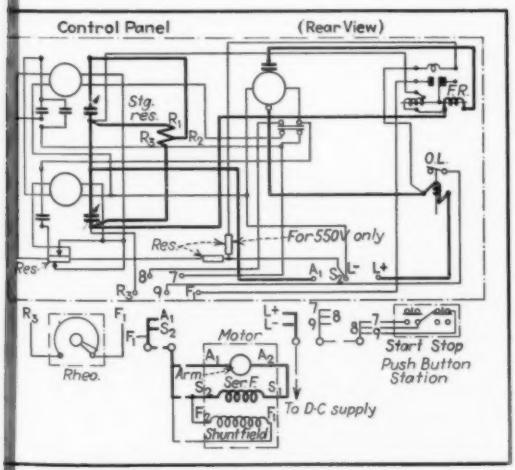
SELECTION CHART FOR D.C. CONTROLLERS

TYPE OF MOTOR			CONSTANT SPEED	ADJUSTABLE SPEED
Method of Control			Type of Controllers	
For Manual Control	Non-Reversing	Across-the-line starting (with OL protection)	Manual starters, up to 2 hp. Generally toggle type quick acting with thermal overload	No
		Reduced current starting (with LV protection)	Rheostat	No
		Speed Adjustment (with LV protection)	Rheostat	Rheostat
	Reversing	Across-the-line starting	Drum switch, up to 2 hp.	No
		Speed Adjustment	Drum controller and armature circuit resistor	Drum controller and field rheostat
For Magnetic Control (Remote Push-button Operation)*	Non-Reversing	Across-the-line starting (OL and LV protection)	Line starter	No
		Reduced current starting (OL and LV protection)	Time starter	Time starter and field rheostat
	Reversing	Across-the-line starting (OL and LV protection)	Line starter	No
		Reduced current starting (OL and LV protection)	Time starter	Time starter and field rheostat

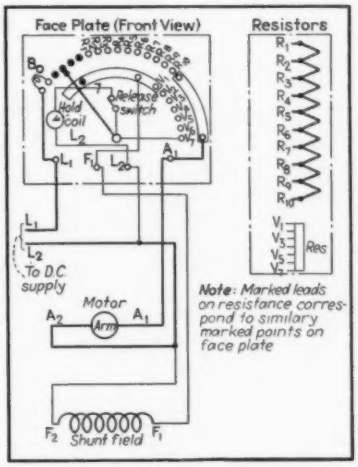
OL = Overload LV = Low voltage

*Other remote control devices can be used but low voltage release may be obtained instead of low voltage protection.

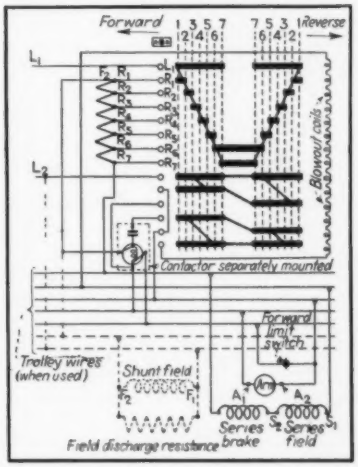
TYPICAL WIRING DIAGRAMS



MAGNETIC STARTER for non-reversing adjustable speed motor.



FACE-PLATE TYPE rheostat regulates armature and field of shunt motor.



DRUM CONTROLLER, Series brake and limit switch for compound motor.

the braking resistor acts as a load on the generator. Braking resistors are seldom designed to permit more than 150 per cent load current at the instant the braking circuit is closed. Dynamic braking is seldom applied to series motors because the series field must be reversed to be effective for dynamic braking, and this complicates the control.

"Plugging" is another method of bringing motors to a quick stop by connecting the motor to the power lines in the opposite direction. It is used most often with series motors or very heavily compounded motors.

Resistors

Resistors in armature circuits can be used for starting or speed regulation. If they are for speed regulation, they have different ohmic values and greater current-carrying capacity, because they must remain in the circuit for continuous operation. Speed-regulation resistors are divided into two classes; (1) *constant-torque* or machine duty—for use where the load decreases directly with the speed; (2) *variable-torque* or fan duty—for use where the load decreases at a greater rate than the decrease in speed.

***CONTROL AND RHEOSTAT** are mounted directly on this d.c. rolling mill.*

Resistors are also used for other controller functions: dynamic braking and plugging resistors for quick stopping or reversing of the motor; and field resistors for speed increases above normal.

Safety Features

The earlier types of controllers were open or partly inclosed. Now many standard and special controllers are inclosed.

To prevent the motor restarting automatically after a voltage failure, or excessively low voltage, a device providing low-voltage protection should be included, whenever possible, to disconnect the motor from the line.

All control should have a device for protection against sustained overload. Thermal relays have an inverse-time delay feature and are generally used for overload protection. They are not designed to protect motors or conductors in case of extremely high currents, such as occur when short circuit conditions exist. Fuses and circuit breakers are to be used for such protection.

Application to Motors

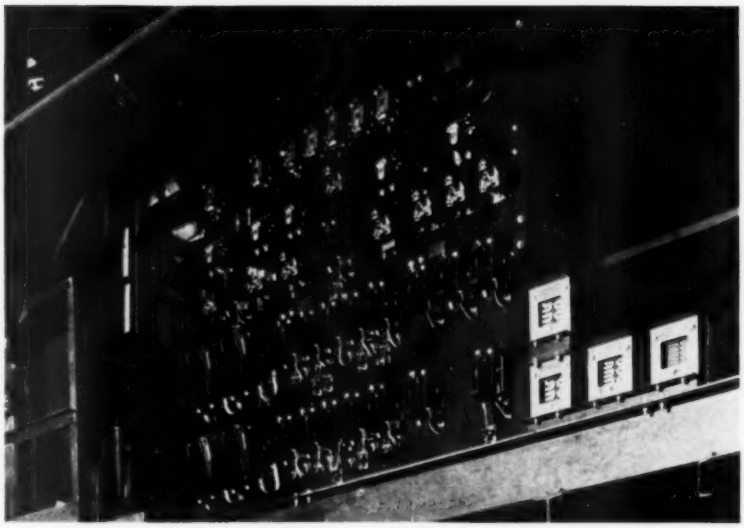
Full voltage controllers, either manual or magnetic, can be used to connect small d.c. motors, up to about 2 hp., directly to the line. However, they may also be used for larger motors of special design.

Reduced-voltage controllers, either manual or magnetic, are used to operate d.c. motors, rated ½ hp. and larger.

Manual reduced voltage starters and speed regulators of the face-plate type, with self-contained resistors, are non-reversing and are used with motors up to approximately 25 hp. Separate devices are necessary for reversing service.

Drum controllers with separately mounted resistors for starting or speed regulating duty may be used with motors up to about 50 hp. They are furnished for either non-reversing or reversing service.

Magnetic controllers are used for any size of motor and can be obtained for non-reversing or reversing service and to include other basic functions.



***OUT OF HARM'S WAY**—But accessible for servicing. This d.c. controller for a wire-drawing machine in a copper mill is located on a balcony. A sheet-steel projection, above the panel, shelters it from falling dust. Note the comparative sizes of the contactors in the lowest row: from left to right, two 600-amp, five 150-amp with electrical interlocks, one 100-amp, and one spring-closed 100-amp. contactor with electrical interlock.*

Selection

Every installation has its individual requirements. The following factors need consideration to insure correct applications:

1. Type and rating of motor;
2. Power supply characteristics and limitations;
3. Machine to be driven;
4. Inertia of machine;
5. Overhauling by load;
6. Starting torque;
7. Frequency of starting;
8. Accelerating time;
9. Speed and running time;
10. Manual, pilot or automatic control;
11. Stopping, reversing, speed regulating requirements;
12. Protective and enclosing features;
13. Mounting and vibration.

In many cases standard controllers can be selected. Occasionally the application has some operating characteristic that is a departure from standard, in which case a different combination of control devices will be required or a special controller must be designed for the purpose.

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Cut YOUR Electric Power Costs, Too!

Eliminate Duplicate Power and Lighting Wiring . . . .

Leaders are showing the way to greater savings—bringing into the plant one system of higher voltage—then for lamps, electrical tools and appliances, they supply the lower voltage circuits where wanted by means of Jefferson Power Circuit Transformers.

Besides the saving in copper, conduit, and less line drop, full advantage is taken of the lower-cost power rates.

Jefferson Transformers are made in capacities ranging from .05 KVA to 40. KVA; they are air-cooled, equipped for column, wall or floor mounting and are supplied with roomy wiring compartments.

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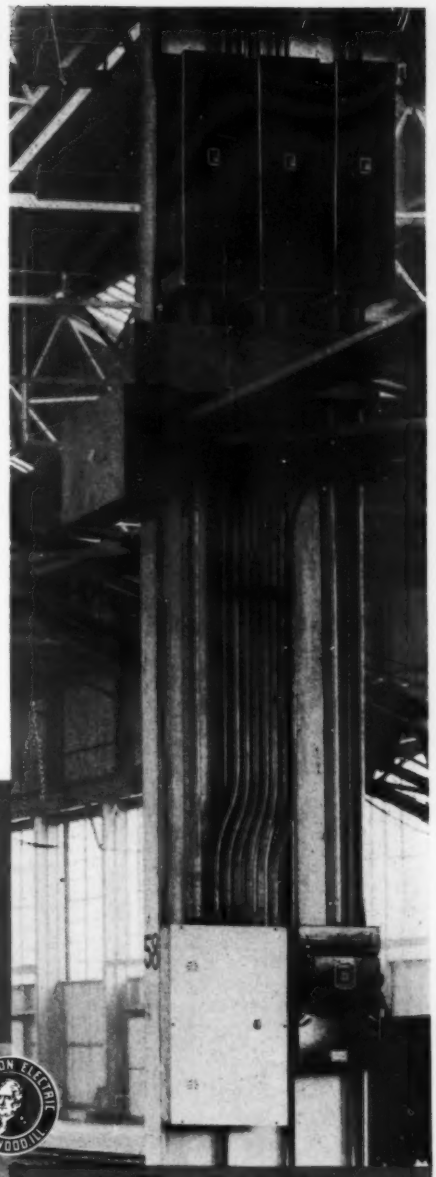

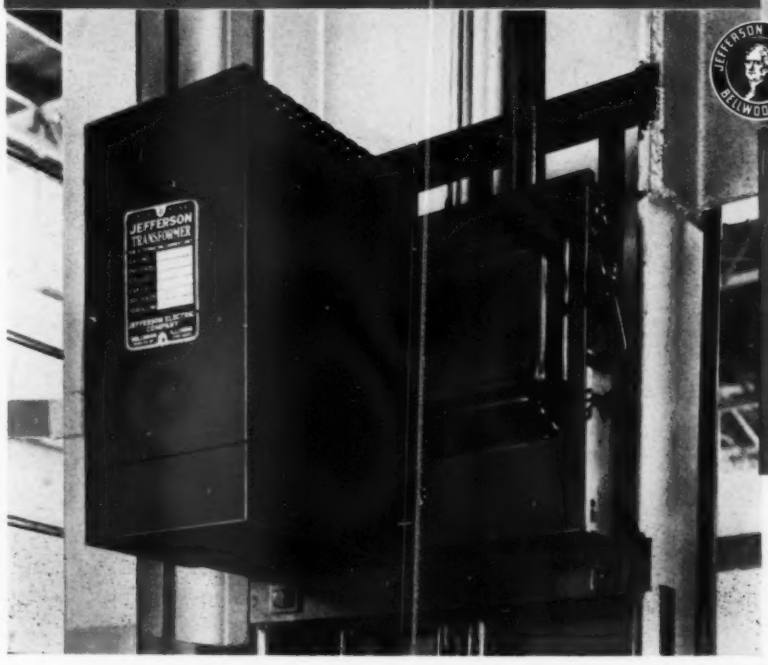

Above: Three on a wall panel.
At Left: One of 32 installed in this Diesel engine plant.

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No. 381 PCT

Complete information and data for selection and use of Jefferson Power Circuit Transformers. Mail the coupon today.

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- Easy to Bend and Rebend
- No Threads
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- Easy to Install
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- Assistance of a Field Force

Knurled inside finish (Patent No. 1,962,876) available in ½", ¾" and 1" sizes.

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SPACIOUS—
YET COMPACT
! ! ! !

SIZE No. 1
FORM M. A.
BULLETIN 6013
A. C. STARTER

SPACIOUS—YET COMPACT!

That sounds like a contradiction—yet in a Nema Type 1 sheet steel cabinet 7¼" wide, 4½" deep and 10 1/16" high, this Bulletin 6013 Across-the-Line Starter provides a husky multi-pole Bulletin 7700 A. C. Contactor and a burly Bulletin 7322 Thermal Overload Relay, with Reset Push Button in the cover.

Plenty of space for easy wiring—adequate electrical clearances—time-tested materials—modern engineering practise—these all contribute to the excellent service "3C" Starters are giving in thousands of industrial applications.

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OUR NEAREST OFFICE
IS AT YOUR SERVICE

THE CLARK CONTROLLER CO.
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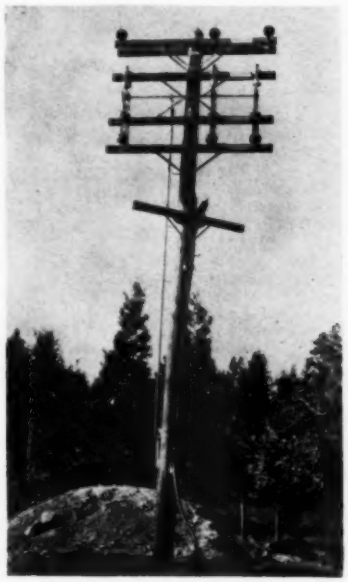
Saves $4,000 Installation Costs

A vertical, 2-3/4-in., diamond-drilled hole, running 500 ft. to meet a 6,000-ft. tunnel, cut more than $4,000 from the previously estimated power-transmission expenses of the Lava Gap Gold Mine, located near Grass Valley, California. The estimated cost of installing a power-transmission system for the 150 hp. double-drum hoist, air compressor, and two pumps—which were stationed far down in the tunnel in order to sink the shaft—had been $7,000. This figure involved the cost of power transmission through the entire tunnel length.



GOING DOWN!—Transmission line, 11,000 volts, 3 phase, 60 cycles, connected to underground substation by cable in 500-ft. diamond-drilled hole.

With the small hole drilled, a 3-conductor, lead-covered, steel-armored General Electric cable was dropped direct to the substation at an overall cost of $2,575. This installation is expected to produce further savings, as the wire is free from the wear it would have incurred, from the constant transportation of ore if the cable had been run through the tunnel itself.

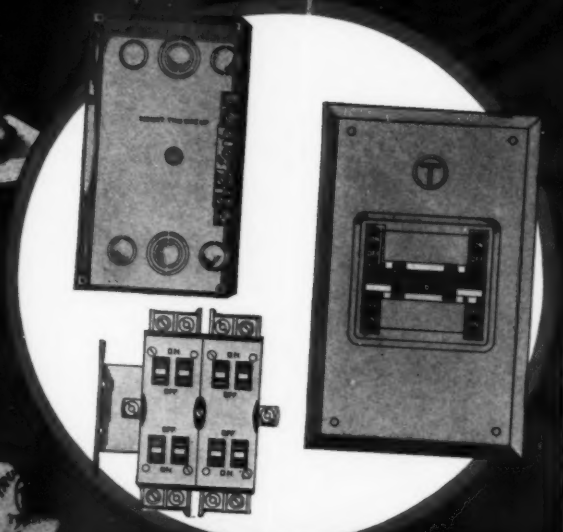
As the Inspector Sees Us!

Often electrical distribution devices and equipment are loosened or deteriorate, and temporary installations are unintentionally forgotten. In the following list are a few defects which commonly occur in industrial plants

Service Equipment

EW MULTI-BREAKER FEATURES HELP CONTRACTORS

"Install the box . . . now SEPARATELY PACKED . . . during construction. Place the new REMOVABLE saddle-mounted Multi-Breaker unit and cover when work is finished. With removable units your wiring job is easier, and there's no danger of damage to unit or cover during building." . . . . . .



"That makes two more good reasons why smart contractors are standardizing on Trumbull Multi-breakers to tie right in with intensified residential building campaigns as well as on store, garage, office and even industrial jobs. The Multi-breaker idea . . . super-safe, economical and convenient . . . actually helps SELL adequate wiring plans." . . .

"The fact is, I find myself making new customers and friends wherever I bring wiring up-to-date with this time and trouble saving circuit breaker load center. It takes no more than a flip of a switch to restore service where circuits are protected against short circuit and dangerous overloads by Trumbull Multi-breakers. Send for our new Service Equipment Bulletin 176." . . .

The New Type Trumbull Multi-breakers will be further described and illustrated in the July issue of Trumbull Cheer . . . interesting and informative monthly magazine that goes to 35,000 electrical men. If you are not on this list, please write us.

The TRUMBULL ELECTRIC MFG. CO.

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GENERAL ELECTRIC ORGANIZATION

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What they are Saying!

"I HEARD THAT INSULATION INCORPORATED HAS REVISED ITS CATALOG"

"YES AND I'M SENDING FOR MY COPY TODAY"

This is really news of the day and important also. Those who have been using Insulation Incorporated service for magnet and Lead Wire and Insulating Materials certainly will want a copy. Those who haven't used this service yet should send for a copy of the revised catalog and try the service—you'll like it, profit by it, and use it regularly. No time like the present to begin.

CAPACITORS
NOW ADDED TO OUR LINE
The revised catalog will feature capacitors made by Aerovox Corporation.

ORDER FROM
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Quality - Dependability - Service

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HOW TO INSTALL B-M FITTINGS

TELESCOPE BM SYSTEM

To properly install B-M fittings, two sets of diametrically opposite indentations are required by the local inspection departments, as per cuts. Complete closure of the jaws of the Indenter is necessary to obtain suitable indentations. The resulting joint has good ground continuity and will withstand more strain than will ever be required.

Play Safe! Insist on the genuine B-M Telescope fittings, as B-M fittings are the only Telescope fittings locked to E. M. T. by indentations approved by the Underwriters' Laboratories under Section 508, Article 5, of the 1933 National Electrical Code.

B-M fittings and tools are manufactured under U. S. patents, Nos. 1,998,654 and 2,035,686; other patents pending. For further details on these modern fittings see your distributor or write to Briegel Method Tool Co., not incorporated, Galva, Illinois.

The HARTMAN LINE GROUND CLAMP—
Is threadless. Receives rigid or thin wall conduit at any angle. U bolts from 1¼" to 6".

The HARTMAN GROUND BUSHING
is the last word in bonding devices. It has a set screw to adjust the bushing at any point and a long screw and washer under which the ground wire may be folded. Made of cast aluminum alloy or brass with a buff polished finish.

for details write

B. HARTMAN
708 W. Esther St.
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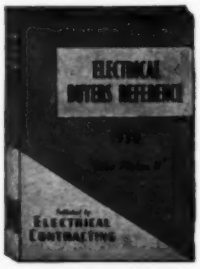
You'll find the answer to thousands of questions about electrical products in



and commercial buildings. They are violations of the National Electric Code and may be found by the inspector. It would be well to have them corrected before the "unexpected visit."

1. Cutout and switch boxes deteriorated (Covers loose or missing, side of box rusted out).
2. Conduit improperly supported.
3. Conduit improperly terminated in boxes.
4. Open wiring subject to mechanical injury.
5. Bare open wiring.
6. Open wiring improperly protected where it goes through a partition.
7. Disconnect switches improperly mounted or enclosed.
8. Enclosing cases for electrical disconnecting devices used to store articles.
9. Other than heavy duty cord used for extension purposes.
10. Broken and deteriorated lighting fixtures need replacing.
11. Long lighting drops used as extension cords.
12. Panel boards, cutout bases, switch bases, cracked or broken.
13. Loose, open, temporary wiring used for permanent installation.
14. Motors temporarily installed and left as a permanent installation.
15. Oil-soaked windings and rubber deteriorated by oil.

More "Elbow Room" with Gear Drives

A great variety of gearmotors (motors and gears built together) as well as a number of gear reducers can be used with the standard motors. Combinations of various speeds and of different types of gears make it possible to find a unit which will fit into almost any situation. Whether it is a plain case of lack of room or an idea to fit the motor drive into one of pleasing appearance, somewhere there is a manufacturer who makes just what is needed.

In one case, it was necessary to provide a drive for a small elevator. Only a 2-hp. motor was required, but the available space for the complete drive was less than 24 in. by 24 in. by 34 in. It was impossible to secure a countershaft outside of the geared one on the head, and this required a speed of 220 r.p.m. The problem was to reduce the speed in the available space. After consulting several different manufacturers and comparing dimensions, a geared motor unit was found which would just fit into the space.

A flexible coupling was used to connect the gear-driven shaft to the shaft

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TORCHES and SOLDERING IRONS

These torches and soldering irons supply proper heat for neat, rapid, economical installation of wire and cable. The torches, for open-flame work, produce instantly a concentrated, exactly controlled flame of high temperature. The soldering irons, for enclosed-flame work, can be kept constantly at a desired heat.

These appliances use Prest-O-Lite Gas—which is convenient, economical, and obtainable at thousands of Prest-O-Lite Gas Exchange Service Stations.

Your jobber will demonstrate Prest-O-Lite Torches and Soldering Irons. Call him—or write the Linde office near you.

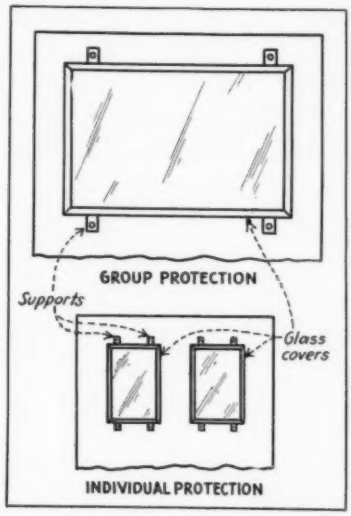
The word "Prest-O-Lite" used herein is a registered trade-mark.

THE LINDE AIR PRODUCTS COMPANY
Unit of
Union Carbide and Carbon Corporation
New York and Principal Cities
In Canada
Dominion Oxygen Co., Limited, Toronto

on the elevator head. This coupling was bored to fit the two different sized shafts. The totally inclosed gears provided a dustproof installation which worked efficiently and has never given any trouble. In other cases, it might be possible to use one of the gear units in which a standard motor is simply bolted to a frame that supports the gear train. The advantage is that should the motor ever burn out, any standard make of the same horsepower and speed could be substituted, rather than waiting for a motor in a specia' frame. This could be obtained only from the manufacturer of that partic ular unit.

Protecting Relays Against Dust and Moisture

The presence of dust and moisture in the vicinity of low-tension relays is the cause of many failures in signal circuits. These failures are generally occasioned by defective contacts at the

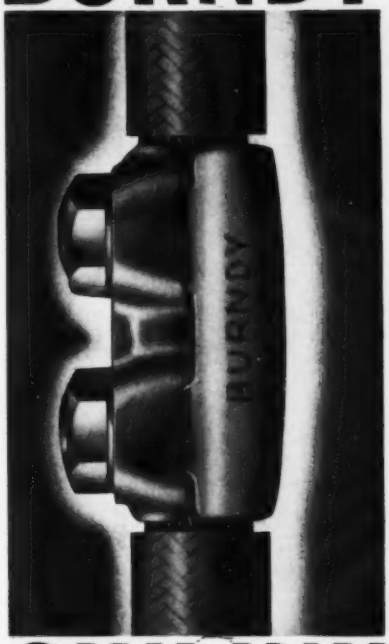


GUARDING RELAYS—Recommended methods for inclosing relays under glass, where dust or moisture threatens.

contact springs, often due to an accumulation of dust and moisture. On the other hand, moisture also causes defective operation of the armatures of the relays as the pivots and shafts "freeze." Moisture also brings "break downs" in the insulation and the winding of the actuating coil of the relay.

Several methods are used to eliminate this trouble. Perhaps the simplest and one of the most satisfactory methods is to construct a wood or metal frame sufficiently large to cover all relays, and insert a glass in this frame so that the action of the relays may be observed. Rubber gaskets may be placed between the frame

BURNDY



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TELESCOPE BM SYSTEM
CONNECTORS
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inexpensive . . . simple easy installations . . .

Strong, dependable installation can be made quickly and economically with B-M Connectors and Couplings. Contractors find them indispensible because of the satisfactory results and good looking jobs made possible by this simple method.
Our tools and method of fastening the fittings to the tubing are patented, and we, therefore, limit the license of our tools under our patents to the installation of our fittings only.

BRIEGEL METHOD TOOL CO.
not incorporated
Galva, Illinois
B-M Indenter (600) is the only tool necessary to make perfect installations. Interchangeable jaws for ½", ¾", and 1" fittings. Holder and cutter are available though vises and hack saws can be used.

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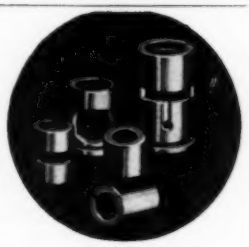
Millions of RIGID users find their wrench costs have dropped because this extraordinary wrench lasts far longer.
They find their expense for wrench repairs cut fully 75% because of that RIGID guarantee.
These savings are important these days.
The safe all-alloy RIGID does better easier work. Safe powerful chrome molybdenum jaws and handle. Adjusting nut *always* spins easily in all sizes, 6" to 60".
Cut your tool expense—order RIGID wrenches today from your Supply House.

THE RIDGE TOOL CO. ELYRIA, OHIO

RIGID PIPE TOOLS



JUST as easily as you could reach up and take them out of a bin, you can procure Bunting Quality service replacement bearings for all makes of electric motors from 1/40 hp to 60 hp. Completely machined and finished—ready for assembly. . . . Instantly available from stock in any quantity at attractive low prices.

Write for catalog giving complete specification data.

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BABBITT METALS

and the panel on which the relays are mounted. The glass may be sealed in the frame with a sealing compound.

Individual relays may be protected in the same manner if desired, or may be covered by any number of glass dishes or covers. These are available in hardware and other stores. These dishes may be gasketed at the panel to exclude dust and moisture, and may be held in place by the use of metal bands or a combination of screws and washers.

Time Switch Helps Reduce Demand Charge

Power required for a heat-treating furnace is almost two-thirds of the connected load in an eastern foundry. Demand charges have been reduced considerably by installing a time switch and operating the furnace at night.

The time switch automatically starts the furnace after 5 p.m. and shuts off the power at 7 o'clock the next morning. Night operation of the furnace has resulted in more economical use of power, for between 5 p.m. and 7 a.m. practically no other equipment in the plant is in use.

During the daytime hours, the castings are cleaned and ground in preparation for heat treatment.

To Correct a Wrong Impression

A reader has questioned an item which appeared on page 46 in *Electrical Contracting*, in April entitled "Extension Cords for Electric Tools." It discussed the use of single-conductor weatherproof wires for low-cost (temporary) connections to remotely located portable electric tools.

He writes: "Weatherproof wire is not considered as insulated wire and is intended for use only on insulators. The practice, recommended, would be decidedly hazardous and should be avoided.

"While it is true that rubber jacketed portable cables are somewhat expensive, they are designed for the severe service which is experienced on portable tools."

The article intended to point out the need for heavier temporary conductors, if portable tools were to be operated temporarily at considerable distances beyond the last wired outlet. Of course, if the job is to last any length of time or if a tool must be used for an operation which will be continuous in that part of the plant, adequate power lines and approved plug outlets should be installed for permanent use. But the comment was good just the same.

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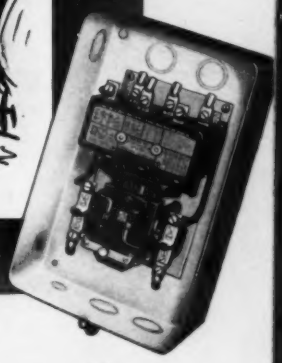


Bulletin 709
Solenoid
Starter

"He says he's never seen anything so simple!"

You've never seen such a simple motor starter, either. It was to prevent all possibility of trouble that these Allen-Bradley solenoid starters were made so simple. Moving parts were kept to a minimum. These solenoid starters have no trouble-making pivots, pins, bearings, or hinges, which so often delay switch action. Complicated mechanisms have been avoided. And of course there are no flexible jumpers. That's why they give extra millions of trouble-free operations. Engineers everywhere specify "Allen-Bradley." Write for 24-page booklet, "The Story of the Solenoid Starter."

of
ALLEN-BRADLEY SOLENOID STARTERS

- No Contact Maintenance
- Millions of Trouble-Free Operations
- Compact without Sacrifice of Wiring Space
- Easy to Install because of the Many Knockouts and White Interiors
- Attractive Appearance

A-B

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

NINE REASONS

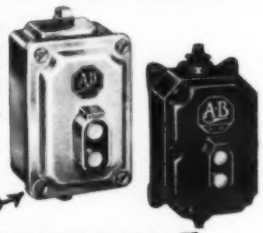
why 146,273 Bulletin 609's are now in daily use—

Bulletin 609—the recognized standard for small a-c motors. Maximum rating: Single phase, 1½ hp, 110 volts; 3 hp, 220 volts. Polyphase, 5 hp, 220 volts; 7½ hp, 440-550 volts.

TWO SIZES

Also in Special Enclosures

Bulletin 609 starters are available with standard, cadmium plated water-tight, and black enameled explosion-proof cabinets.



WATER-TIGHT

EXPLOSION-PROOF

WRITE FOR BULLETIN 609

Allen-Bradley Co.,
1307 S. First St.,
Milwaukee, Wis.

Please send me Bulletin 609

NAME.....

COMPANY.....

STREET.....

CITY.....STATE.....

1 **PUSH BUTTON OPERATION**—"Start" and "stop" buttons make it just as easy to operate as a push button station. The starter can be locked in its "off" position.

2 **QUICK MAKE-AND-BREAK**—A simple toggle opens and closes the contacts with a snap action, preventing contact burning and thus assuring long contact life.

3 **NO CONTACT MAINTENANCE**—The large double break, silver alloy contacts never need cleaning or filing. A molded arc hood prevents flashovers between poles.

4 **RELIABLE OVERLOAD PROTECTION**—Two breakers protect the motor from all sustained overloads. After tripping, pressing the "stop" button resets the breakers.

5 **TROUBLE-FREE CONSTRUCTION**—The quick make-and-break mechanism is simple and rugged. The foolproof operating mechanism is protected against tampering.

6 **SMALLEST SIZE**—Despite its high current interrupting capacity, the Bulletin 609 is smaller than any other hand-operated starter of its rating on the market.

7 **WHITE INTERIOR**—The white enameled interior reflects light and illuminates the starter mechanism even in dark places, making installation and inspection easy.

8 **EASY TO INSTALL**—Has a surprising amount of wiring room, terminals accessible from the front, knockouts on all sides of cabinet, and removable cabinet cover.

9 **ATTRACTIVE APPEARANCE**—With its glossy black enclosure and clean cut, rugged appearance inside, Bulletin 609 starter is a sales asset on any machine.

LOOK FOR THE A-B TRADEMARK
ON MODERN PRODUCTION MACHINES

ALLEN-BRADLEY
MOTOR CONTROL

A-B
Allen-Bradley

UMI

Come Out Of the Shop

[FROM PAGE 11]

ized and product-minded manufacturers are increasingly beset by equipment problems. And the growing complexity of electric motors and control is one of the things that is particularly bedevilling them.

Management appreciates that electrification offers new possibilities for both increasing production and reducing costs. But the uses of electricity are becoming harder and harder for them to understand. And after all this is not the main problem of management, which after all is the individual problem of making money.

What Industry Needs

Let's take a quick look at these things that are worrying industrial management today. I will cite a few—

1 In the metal-working industry, they're expanding the use of welding and they need technical advice on equipment and its arrangement and use. They are also backward in control and illumination.

2 In the chemical industry, there is a growing need for vapor-explosion-proof wiring and equipment, and management wonders how far it should go. Power application and control and better lighting are also gaining in importance.

3 In the textile industry, where a quarter cent per yard may mean the difference between profit and loss today, the extension of individual and multi-motor applications is being studied. There is also growing interest in the use of instruments to check power factor and production and to correct other troubles in the system.

4 In the food processing industry, the obsolescence of wiring is becoming alarming. There is also a trend toward individual motors and the use of cleaner, safer, vapor, splash and corrosion-proof equipment. Management here is also becoming concerned with the benefits of ultra-violet irradiation and electronic control.

5 In the mining industry they are extending the use of electricity underground and this brings many problems.

Throughout industry in general we can list eight major improvements that are sorely needed—

1. More adequate and flexible distribution
2. More reliable protection
3. Power factor correction
4. Replacement of obsolete motors
5. More automatic controls
6. Use of instruments for checking
7. Wider use of furnaces and welding
8. More effective illumination

Right down the line this involves problems of electrical selection, application, coordination and maintenance that are beyond the knowledge and experience of most industrial executives. The question is—Do we want to help with these problems or not?

Take the Burden

If the answer is yes, then we must quit being just repair men. We must quit thinking about motors and focus on the customer. We must get out of the Fix-It attitude. To put it more broadly the motor service shop should take over a little more of the burden of industrial progress, by becoming more creative, through solving these pressing problems for industrial management.

Also we've got to face a further call for even closer specialization. For who will service the complicated control equipment of air conditioning? Who will service farm motors? These new fields are developing strange types of equipment, in some cases smaller machines than we like to deal with. But these needs are growing. They must be met. And if we want to command the motor market, and enjoy its profits we must meet them.

Of course, this is all just a long winded way of saying that the motor shop should do a better selling job. It should offer more cooperation on the problems that effect the customer. This is not a new idea, God knows. But neglect of it is a besetting sin.

NISA Can Help

We hope to see NISA make an effort in this direction. Also we hope to see this organization go forward in establishing standards certifying qualified shops, compiling shop cost statistics, stabilizing rebuilt motor markets, interchanging experience and in developing other constructive cooperation.

But NISA can't do the whole job. There must be better business methods, better selling, locally and individually. The first step, I believe, is to pull our minds out of the shop and get away from the Fix-It idea. After all, this is a business and it needs the natural nourishment that comes from advertising, selling, market study and cooperation between shops on common problems. We need this, now.

QUALITY *means* ECONOMY

- EASIER BENDING
- EASIER CUTTING
- EASIER THREADING
- EASIER WIRE PULLING

"ELECTRICTUBE"

Electrical Metallic Tubing is coated on the outside with a substantial amount of zinc evenly deposited by electro-plating process to stand severe corrosive conditions. Interior surface is coated with an enamel especially developed by us, which is impervious to acid and insures a perfect raceway for pulling wires. Can be used with any standard light wall fittings.

"GALVAKOTE"

Exterior surface and threads coated with zinc evenly deposited by electro-plating process in quantity to withstand more than four dips of Preece test in regulation copper sulphate solution. Interior furnished coated with the best quality black enamel.

"ENAMELKOTE"

Coated inside and outside with high-grade black enamel, properly baked in modern ovens to insure adhesion to pipe wall, and sufficient flexibility to prevent flaking in bending.

"HOTKOTE"

Exterior and interior surfaces evenly coated by the hot galvanize process and then covered inside and outside with a coat of transparent enamel.

"HOTKOTE" NIPPLES

These rigid conduit nipples are also approved by the Underwriters' Laboratories and so labeled. All threads are protected with a special coating that is rust resisting.

Underwriters' Laboratories tested and approved.

Distributed everywhere by leading wholesalers.

CLAYTON MARK & COMPANY

20 N. Wacker Drive, Chicago U. S. A.

MANUFACTURERS FOR MORE THAN A THIRD OF A CENTURY.

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Rules for Marine Work

Q. *"We do a great deal of marine electrical work and we have been unable to get any printed set of rules to govern. Each job is subject to the interpretation and inspection of the local marine inspectors, who are not electricians. And even though they do pass the job, their decision is not final, as the traveling inspector has the final say. He might come around after the job is finished and condemn it. Is it possible that your magazine can procure for us, a set of printed rules for marine installation?"*—H.L.B.

A. The National Electrical Code up to and including the 1920 edition included rules for marine work. By that time, it was felt that rules on marine work were not of much benefit to the general users of the National Electrical Code and, therefore, they were omitted from the 1923 edition. The only mention made in that issue was in the index which contained this item: "Machine Work. (See Rules of the National Fire Protection Association)." This item is still continued in the index of the present edition of the National Electrical Code.

At the time of the rearrangement and revision of the Code for the 1923 Edition, the N.F.P.A. Marine Section took over the sponsorship of the electrical rules for Marine Work, and these rules were incorporated in Appendix D of the Regulations Governing Marine Fire Hazards.

Section 150 of Part D reads.—

"151. Electrical installations operating at potential of 32 volts and over shall be in accordance with Recommended Practice for Electrical Installations on Shipboard of the American Institute of Electric Engineers (Publication No. 45, Oct. 1930). . . ." Then follow rules governing installations for voltages under 32.

For these rules for Marine installations, write AIEE, 33 W. 39th St., New York City. Price $1.50.

Use of Neutral Conductor in Service

Q. *"In a 3 wire 110/220 volt set-up, is it necessary to bring the neutral wire back up the pole again on the load side of the main switch or can one "tie-in" be used at the top of the pole, thereby, saving one wire and possibly a size or so in conduit for the load side circuit?"*—A.C.B.

A. The neutral conductor must be carried down the pole to the service equipment cabinet. A means must be provided in the cabinet for disconnecting the neutral from the interior wiring, according to section 2351 C of the Code. A jumper, as suggested at the top of the pole, must not be used.

Outlets on Circuit

Q. *"In Electrical Contracting's February issue, your answer to Outlets on Circuit I believe is not complete. You forgot Rule 2108."*—F.E.R.

A. In answering the question of G.E.N. in the February issue, we understood that he referred to receptacles feeding lamps on display for sale. These would be lighted up only while being displayed to a customer, and not left lighted all of the time.

If the fixtures are all to be kept lighted all of the time and thus produce a continuous load, the second sentence of Section 2108 would apply and the number of outlets would be determined from Section 2107b as follows: 15 amps. $\div$ 1½ amps. $\times$ 80% = 8 outlets, which would, of course, provide 16 duplex receptacles.

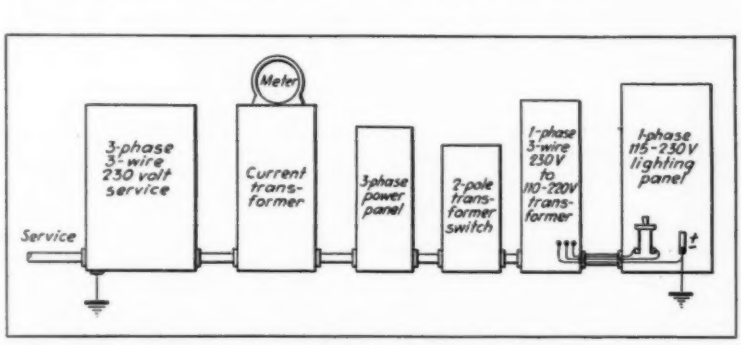
This treatment of Section 2107 really places a restriction of not over 10 outlets in some cases and 8 outlets where continuous loads are to be used on branch circuits, in place of the old restriction of 12 outlets per circuit as in the 1935 and previous Codes.

Grounding on 230-Volts

Q. *"Is it necessary to ground the neutral conductor on a 3-wire single phase system derived from a transformer whose primary is 3-phase 3-wire 230 volts? The 3-phase is in the building and the conditions are as in the sketch below."*—B.D.

A. Section 2001 requires, in general, that all interior wiring systems have a grounded identified conductor. Exception to this is made in Section 2007, which permits the use of two-wire branch circuits and multi-wire A.C. circuits tapped from the ungrounded wires of circuits having identified grounded neutrals. This, of course, permits the use of power circuits which do not need a neutral conductor and, with certain other restrictions, also permits 220 volt lighting.

In the case of the single phase lighting system of 115-230 volts with a grounded neutral, as indicated in the above sketch, the neutral from the lighting transformer should be grounded at the lighting panel and on the supply side of a main switch on the panel. This is covered in Section 2535 of the 1937 Code.



GROUNDED LIGHTING *system derived from 3-phase 3-wire 230-volt power service.*

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

ENTIRELY CRESCENT MADE

CRESFLEX NON-METALLIC SHEATHED CABLE

ARMORED BUSHED CABLE—TYPE A. C.

These splendid examples of CRESCENT manufacture were

RUBBER COVERED CABLE

EXTRA FLEXIBLE PORTABLE CABLE

MADE FROM START TO FINISH IN THE CRESCENT PLANT

The careful supervision given to the manufacture of Crescent Wire and Cable from raw material to finished product is only one reason why these products are of a uniformly high quality. Engineering skill of a high order has been devoted for many years to the improvement of the processes of production, and applying those improvements to CRESCENT products so that they last longer and perform better on even the toughest assignments.

CRESCENT INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER PROOF WIRE

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In the News

NEW YORKERS AT BIG MOOSE

With four days of meetings, the New York State Contractors held another of their famous conventions at Big Moose. Here they combine oratory and recreation on this beautiful lake in the Adirondack forest. E. G. May of Albany was president this year and Lincoln Bush chairman of the board. The program presented much talent.

Bon Clark, president of the Westinghouse Electric Supply Company spoke on distribution problems. Elliott Harrison of General Electric discussed the air conditioning opportunity and M. F. McCarthy of Frigidaire presented the commercial refrigeration market. In a utility session H. E. Dexter of Poughkeepsie offered interesting experience in wiring for the low income home, and H. C. Thuerk of New York City outlined the contractors interest in present power company problems. W. L. Bliven spoke for the inspector.

Earl Peak, speaking for NECA, urged action in developing the immediate market for modernizing wiring in industrial, commercial and residential buildings. Laurence W. Davis presented the Adequate Wiring Program and Lincoln Bush, as president of the Electrical & Gas Association of New York, advanced the possibilities of local cooperation.

Officers elected for the coming year were A. Lincoln Bush, chairman of the board; E. G. May, president; Walter Langdon and J. F. O'Brien, vice-presidents; J. F. Burns, treasurer and H. F. Janick, secretary.

MEDALISTS HONOR JAMES H. McGRAW

James H. McGraw, founder of the McGraw-Hill Publishing Company, Inc., was guest of honor at a dinner given him by the men who have received medals under the McGraw Award. The dinner took place on June 6 at Atlantic City in the Hotel Traymore, during the convention of the Edison Electric Institute.

Horace P. Liversidge, vice-president of the Philadelphia Electric Company, acted as host to the dinner. J. Robert Crouse, former leader of the incandescent lamp industry, was toastmaster and spoke as the first man to receive the medal. Charles E. Swartzbaugh, president of the Swartzbaugh Manufacturing Co., spoke as the most recent medalist. George E. Cullinan, vice president of the Graybar Electric Company presented to Mr. McGraw a silver vase engraved with a tribute and signatures of the thirty medalists now living.

Speakers stressed the splendid contribution to electrical progress which Mr. McGraw himself has made in establishing the James H. McGraw Awards in the several branches of the electrical industry. He has provided a medium for the recognition of men who render outstanding service in the development of the electrical market, to the advancement of cooperation within the industry and its service to the American people.

Mr. McGraw in his acknowledgment dwelt upon the importance of the things men think and do beyond the measure of the day's work. "It is these contributions of inspiring leadership" he said, "that fire other men's enthusiasm, extend the common vision, advance the common zeal and create progress. The vital thing, of course, is that these contributions be widely known and that these men receive the acclamation of their fellows. For it is out of this recognition that inspiration comes. And this is the idea impulsing the Award."

The James H. McGraw Award is now in its fourteenth year. It is supported by an endowment fund, administered by a Committee of Awards drawn from the four branches of the electrical industry.

INSPECTORS FORM IOWA CHAPTER

Another group was added to the roster of the Western Section, International Association of Electrical Inspectors, when 101 Iowa inspectors and other interested electrical men met at the Hotel Roosevelt in Cedar Rapids, June 2 and 3 to form the Iowa Chapter. The new organization is a result of two years of effort by Iowa inspectors and officers of the IAEI. The meeting was called by Harry F. Martin, Chief Electrical Inspector of Cedar Rapids who appointed committees to set up the necessary machinery to make official application for a charter.

A series of speakers from associated branches of the industry discussed cooperation. Rural wiring inspections were covered by H. C. Auld, REA Inspector of Davenport, A. C. Tait, explained the National Adequate Wiring Campaign. Discussion of inspection problems was led by F. E. Suddoth, Des Moines electrical inspector, followed by an address on hazardous locations by C. W. Gustafson. Victor H. Tousley outlined important changes in the 1937 Code.

A State Electrical Law for Iowa was actively debated and a committee was au-

MCGRAW AWARD DINNER—Medalists pay tribute to James H. McGraw at dinner in Atlantic City. Starting with Mr. McGraw, left to right, they are—J. Robert Crouse, George E. Cullinan, J. E. North, H. P. Liversidge, W. W. Freeman, Howard Ebelich, C. E. Michel, R. W. E. Moore, W. J. Drury, G. E. Whitwell, James H. McGraw, Jr., S. L. Nicholson, C. L. Collens, O. Fred Rost, George W. Patterson, G. M. Sanborn, Louis Kalischer, C. E. Swartzbaugh.

THEY ALL AGREE ON

Private Interior Telephone Systems

"We're glad we started pushing interior telephones. This business is right up our alley."

"Private telephone systems mean three things to us . . . a clean installation, a nice profit and a pleased customer."

"Our new telephone system has ironed out the kinks in our office . . . don't know why somebody didn't get after us earlier."

● Comments like these confirm our proud boast that Automatic Electric private telephone systems have really made a hit with everybody. And still the market is practically untouched! Every office, shop, factory, and almost every home, is a prospective user.

Automatic Electric makes private telephone systems to fit every need. We show below four of the many types available. Our field representative will be glad to supply you with literature, prices and discounts, as well as work with you on specific jobs. Call on him for help.

SERV-U-FONES

Attractively priced common-talking systems in capacities of two to ten stations. Conveniently packaged, simple to install. Dry cell operated.

AUTO-COMS

Deluxe intercom. systems, providing selective talking and selective signaling service for a maximum of ten stations, and up to five connections at one time. No automatic switchboard needed.

INTERCOMS

Common-talking, selective-ringing systems in capacities of two to eleven stations. Beautifully designed, and durably constructed for long faithful service.

P-A-X's

Private Automatic Exchange systems, available in all capacities. Use standard automatic telephones and provide for a variety of special communication services.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

Sales and Service Offices in Principal Cities ● In Canada: Canadian Telephones & Supplies, Limited, Toronto

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PAINE

"JIM-CRACKS" SAVE YOU *TIME* and *MONEY*

A contractor friend-and-user says: "I call 'em jim-cracks; but GOSH! they're the little things that accumulate big savings in time—and they're designed by someone who understands the kind of job they must do. Those two things considered, I figure I get 'em for nothing."

Adjustable Combination Conduit Hanger FIG. 560

Splendidly adapted for use in odd places and wherever a wide margin of adjustability is called for. Consists of a six-inch length of perforated hanger iron, a gimlet pointed lag screw (flat-end) at one end and a conduit hanger at the other, both affixed with a bolt and nut. Each member is of the size to make a perfectly proportioned complete unit of greatest utility.

SNUGFIT Wire Conduit Hook FIG. 610

Covers more than any other, the circumference of the conduit and fits snugly around the conduit . . . a specially developed PAINE feature that serves to hold the conduit in the desired position. Its prominent nail head makes driving easy.

Perforated Hanger Iron FIG. 500A

Made of mild steel with smoothly rounded edge-all perforations accurate and clean without burr or sharp edge. Supplied in all widths and gauges, in 5 ft. and 10 ft. lengths and in 10 ft. coiled stock. Black stock or hot-dipped galvanized

Pipe Strap FIG. 700

Supplied in both 1-hole and 2-hole. Prominent center rib gives it giant strength. You'll like the uniform gauge, smooth finish and SNUG FIT. Any size.

Romex Strap

No. 201, 1-hole

No. 202, 2-hole

For 14-2 to 10-2 wire—Braidex or Duplex. 22 gauge galvanized stock with the PAINE center rib that gives it extra strength.

THE PAINE CO.

Dept. 587—2947 Carroll Ave., CHICAGO

79 Barclay Street, NEW YORK

SEND FOR THE PAINE CATALOG

In the News

[FROM PAGE 46]

thorized to recommend a plan for state wide inspection facilities.

The officers elected were H. F. Martin, Cedar Rapids, chairman; Otto Bethke, Dubuque, vice chairman and James H. Ehret, Sioux City, Secretary-Treasurer.

CRANSTON RETIRES

James A. Cranston, leader in Pacific Coast Electrification, retired from active work on June 1. He was commercial vice-president of the General Electric Company and began selling electrical equipment in the Far West 49 years ago and is known to all the industry.

NEW NORTH CAROLINA OFFICERS

The North Carolina Association of Electrical Contractors has elected the following officers—O. W. Holmes, Fayetteville, president; Marion B. Haynes, Asheville, E. H. Petree, Winston-Salem, Ralph K. Robinson, Charlotte, and J. G. Hammond, Rocky Mount, vice presidents; Frank E. Hartis, Durham, secretary; M. A. Dickson, Greensboro, assistant secretary; and D. J. Thompson, Raleigh, treasurer.

HEADS RURAL LINE FIRM

The Bethune Electric Construction Corporation has been organized in Birmingham, Ala., to engage largely in rural line construction. John H. Bethune, head of the Bethune Electric Company, is also head of the new concern.

ATWATER HEADS I.E.S.

The Illuminating Engineering Society announced the election of DeNyse W. Atwater, manager of commercial engineering of the Lamp Division of the Westinghouse Electric & Manufacturing Co., as president of the Society for the year beginning October 1st, 1938.

D. W. ATWATER, I.E.S. President.

Mr. Atwater is well known in the field of illumination, having in 1926 played a major role in adapting colored flood-lighting to a world's fair for the first time at the Philadelphia Sesquicentennial Exposition. Long active in the Illuminating Engineering Society, he was for three years its General Secretary, and at various times chairman of the committees on Finance, Papers, Public Information and Editing and Publications.

Other officers elected were: A. D. Cameron, Holophane Co., vice president; Howard M. Sharp, Buffalo, Niagara & Eastern Power Corp., general secretary; Henry G. Clum, Jersey Central Power & Light Co., treasurer; and R. W. Staud of Des Plaines, Ill. and H. L. Johnston of Pittsburgh, as Directors to serve for three years.

"I said splice the cable and you try out your fancy Boy Scout knots!"

TWO GREAT MONEY SAVERS

"MERGE"

WESTINGHOUSE NOFUZE "DE-ION" CIRCUIT BREAKER

WESTINGHOUSE "DE-ION" LINESTARTER

WESTINGHOUSE "DE-ION" COMBINATION LINESTARTER

Two outstanding performers in the motor control and circuit protective fields are now combined in one compact unit. The "De-ion" Linestarter and the Nofuze Circuit Breaker are brought together in the Westinghouse Combination Linestarter.

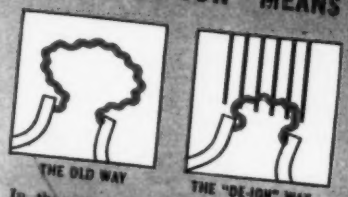
Eliminating the fuse outage costs plus assuring dependable starter performance, the Combination Linestarter is today's most thrifty buy.

- IT SAVES IN INSTALLATION COST
- IT REDUCES OPERATING COST
- IT'S COMPACT
- AND IT'S SUPER-SAFE

Get the new booklet "4 Points to Check" before installing any starters or circuit breakers. It will save you money. Simply call your electrical wholesaler.

Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

WHAT "DE-ION" MEANS



THE OLD WAY — THE "DE-ION" WAY

In the past, arcs have been broken by "stretching". The "De-ion" quencher confines, divides and extinguishes the arc almost instantly—obviously preventing burning heat on contacts or arc barriers.

CHECK THESE 9 FEATURES

- FULL SAFETY
- COMPLETE MOTOR AND CIRCUIT PROTECTION
- BI-METALLIC OVERLOAD PROTECTION
- FRONT OPERATING HANDLE
- AMPLE WIRING SPACE
- UNUSUAL ACCESSIBILITY
- COMPACT SIZE
- ATTRACTIVE APPEARANCE
- LOWER INSTALLED COST

J 20519-A

Westinghouse

"DE-ION" COMBINATION LINESTARTERS

MOTORS • LINESTARTERS • CIRCUIT BREAKERS • SAFETY SWITCHES • PUSH BUTTONS

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FLEXIBILITY plus
STRENGTH and BEAUTY
"THE MAN ON THE FLYING TRAPEZE"—
Yes, or any other gymnast, is a perfect specimen of flexibility — of strength — of beauty. Each and every one of his countless turns represents studied effort with success.
So, too, are Killark Fittings. More than fifteen hundred in number, flat-backed, and made of unbreakable malleable, they are the result of years of engineering research, designed for one common purpose — the one hundred per cent satisfaction of their user. And users everywhere constantly demand them, to answer the problem at hand.
They, too, will give you and your user the big mileage and protection so necessary in conduit fittings.
There are no better fittings than Killark's.
KILLARK ELECTRIC MFG COMPANY
Vandeventer & Easton Avenues
ST. LOUIS, MO.
EVERY POSITION WITH A FLAT BACK
KILLARK Fittings
More than 1500 to choose from
KILLARK ST. LOUIS

In the News

[FROM PAGE 48]

ELEVEN CITIES START CERTIFICATION

Local organization of the Adequate Wiring Campaign is rolling up Eleven cities, serving over four million meters are now set up to certify installations.

Minnesota has a state wide program. Wisconsin plans a state set up. Further west, in Denver, preliminary meetings have been held. Salt Lake City has organized a new league and launched the campaign. Boise has set up an Adequate Wiring Association, with branches in the principal Idaho cities.

In Spokane the program is already operating. Portland has held a meeting to start the plan. In Seattle, the Electric Club of Washington is bringing the industry together anew around the campaign. San Francisco held an all industry conference to launch the plan and similar meetings have been held in Fresno. Southern California also has a program moving with Los Angeles and San Diego active:

Meanwhile, Philadelphia, New York, Boston, Richmond, Louisville, Chattanooga, Birmingham, Cincinnati, Duluth, Omaha, Indianapolis—city after city is taking up the campaign. The demand for promotional material has broken all the record of former industry movements that have been operated out of NEMA headquarters.

COMING MEETINGS

Minnesota Electrical Council—Summer Convention, Duluth, Minn., July 21 to 24.

American Institute of Electrical Engineers—Portland, Oregon, August 9 to 12.

Illuminating Engineering Society—Annual convention, Hotel Nicollet, Minneapolis, Minn., Aug. 29–Sept. 1 incl.

National Electrical Contractors Association—Annual convention, Book-Cadillac Hotel, Detroit, Mich., Sept. 12–15.

International Association of Electrical Inspectors—Eastern Section, Baltimore, Md., Sept. 6–8; Southern Section, Jacksonville, Fla., Sept. 12–14; Western Section, Cleveland, Ohio, Sept. 19–20; Northwestern Section, Hotel Davenport, Spokane, Wash., Oct. 3–6; Southwestern Section, Long Beach, Calif., Oct. 10–12.

National Electrical Manufacturers Association—Annual conference, Palmer House, Chicago, Ill., Oct. 24–28.

SAN FRANCISCO BID DEPOSITORY

San Francisco Electrical Contractors Association and the Master Electricians' Club, after months of committee work and negotiations, have adopted a plan for a bid depository in San Francisco. A. E. Rowe & Co., 660 Mission St., San Francisco will act as depository. Bids can be mailed with a post mark two hours prior to submitting the bid to the awarding authority, or 26 hours prior to bid opening

PERFORMITE

ENDURES

Monumental buildings are built to endure. Only the best of materials are used. Performite insulation for all wires and cables is long-lived, and is ideal for all monumental types of buildings.

By all known accelerated aging tests, Performite rubber insulation is far ahead of any other commercial insulation. It is non-corrosive, free-stripping, long-lasting. Performite shows surprisingly little deterioration in the oxygen bomb, air bomb and air oven accelerated age tests.

One of its outstanding characteristics is its resistance to deterioration by heat. It is recommended for operation at conductor temperatures up to 75 degrees Centigrade, thus providing a tangible advantage over most other types of rubber insulation in economy of copper size. Its stubborn resistance to heat makes it better suited than ordinary rubber insulations for hot locations.

Thus, Performite is the perfect wire for buildings built to last—assuring long life with resistance to heat.

UNIFORMITY · SAFETY · PERFORMITE WIRES & CABLES · LONG LIFE · DEPENDABILITY

HAZARD INSULATED WIRE WORKS

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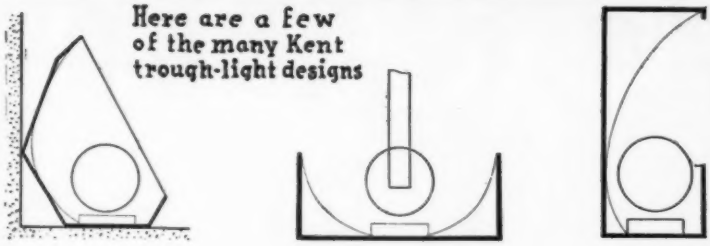
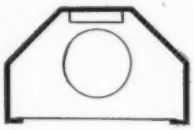
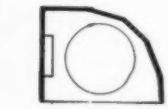
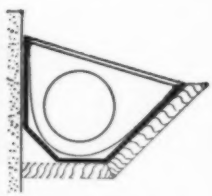


Here are a few of the many Kent trough-light designs







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You'll find this tight-gripping friction tape pliable and easy to handle. It has been treated with special mineral softeners to keep it plastic... prevent hardening, adhere firmly. Comes in full-measure rolls of guaranteed footage.

FRICTION TAPE AMAZON-VICTOR-STICKA

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In the News

[FROM PAGE 50]

time when submitting a bid to a general contractor. The Fair Trade Practice Rules incorporated in the agreement apply only to competitive work in amounts of $100 or more in the city and county of San Francisco. Duplicate bids are opened only after 24 hours beyond the bid-opening time. Registration of the jobs is also required by calling the A. E. Rowe Company.

M. E. SKINNER, vice president, Niagara Hudson Power Corp., three years head of the Better Light—Better Sight Campaign, now is tackling a bigger industry development program as vice chairman of the Adequate Wiring Bureau.

MICHIGAN ORGANIZATION GROWS

The roster of the recently formed Michigan Electrical Contractors' Organization now embraces 44 affiliated local electrical contractors associations. These associations have a total membership of approximately 3500.

The state organization was officially formed February 25, 1938, at Lansing, with W. G. Campbell, Grand Rapids, President; F. J. Groleau, Muskegon, Treasurer and H. B. Gelders, Grand Rapids, Secretary. This meeting, attended by 135 contractors, also approved the by-laws drawn up by C. C. Cadwallader of Detroit. During the progress of organization, meetings are being held in a different community each month.

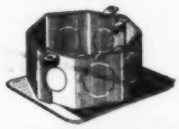
BOOK REVIEWS

Vocational Guide

For young men who want to check up on various trades, the 128-page book "Your Place in Life," discusses twenty-two major vocations and indicates thirty-eight associated ways of making a living. Each trade is discussed in a manner similar to the chapter covering electrical work, headed "Vocations with a Future in the Electrical Field." Here are these topics—Importance of the electrician; Sources of opportunities; What an electrician must know; High school training desirable; Correspondence training; Special qualities needed; Apprenticeship; Unionization; and Future of the trade.

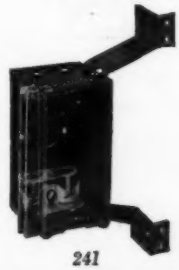
A bibliography recommended for home study, national associations, and leading publications are listed for each trade. Copies of this book available for 25c from The Trail Blazers, 119 West Park Avenue, Champaign, Ill.

A few of the products in the complete RACO • ALL-STEEL • PRODUCTS line:



830 with 895 back plate
Concrete box with back plate. All sizes available.

BOE½
An outlet box for concrete work—with integral nailing ears.



241
Oversize switch boxes with or without "twin brackets"—for all classes of service.

THE SIZE OF THE CATCH

OFTEN DEPENDS ON THE FLY THAT IS USED

● Where there's a preference — in your fishing or in your business activities — it's more profitable to use the product that has *acceptance.* Money and time are lost frequently by trying to force approval.

The continued use of RACO • ALL-STEEL • PRODUCTS enables you to avoid the wasted effort of trying to overcome opposition to materials. Trade and consumer approval have been won by the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings which bear the famous RACO and ALL-STEEL trade-marks.

The total of more than 40 years' experience, combined with engineering which keeps abreast of modern wiring trends, are your assurance of complete satisfaction with every product in the complete RACO • ALL-STEEL line. Adequate stocks are maintained by wholesalers in all parts of the country. Write for catalog and complete information.

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RACO • ALL-STEEL • PRODUCTS

SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES
CABINETS • FUSE CABS • CONDUIT FITTINGS

SHERMAN LUGS

SOLDERLESS

* no loose parts
* screw can't come out
* easy and quick to change
* stronger and lighter than cast lugs
* interchangeable with standard design lugs

SOLDERING

* Low cost—dependable—practical
* Absolutely complete line
* Correctly made

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H. B. SHERMAN MFG. CO.
BATTLE CREEK MICHIGAN

Every Night Regularly

TORK TIME SWITCHES

191 SP
1650 Watts
list $12.75

962 DP
4000 Watts
list $15.00

BUY through your JOBBER
Send for your copy of FREE BULLETIN

The TORK CLOCK CO., Inc.
Mount Vernon, New York

Glorified Chiselling

Big business often laughs at the smaller operator's antics, says C. B. Edwards, of C. B. Edwards Electric Co., Camden, N. J. But when a large generator rewind was recently quoted on by service shops, Edwards had final refusal of the job. He named his price and watched the fun from the sidelines, as the owner got a succession of revised prices from the "big shots" that finally put the job 40 per cent below a fair value. And they claim to be good business executives, who name a price and stick to it.

TIME OUT—A pause for refreshment and some choice yarns between A-W field man A. E. Schanuel (right) and this Charlotte, N. C., group. N. E. Tindal of Duke Power has the bottle; next is Wm. T. Anderson, wholesaler; then J. W. Lewis and Chas B. Miller, Jr., of Duke Power.

The Milwaukee local of I.B.E.W. boasts a "graduate" course of schooling for journeymen electricians. The group meets twice a week to learn the intricacies of control wiring, job layouts, lighting methods and such. The students are journeymen mechanics who want to add some technical information and "book-learning" to their experience. Attendance is voluntary and the course has proved very popular even with the old timers.

Stock Checking

Some prefer cards and file trays to record their salable stocks of motors and control, but E. B. Burr of Electric Maintenance Service Co., Bridgeport, Conn., uses a loose-leaf tabulated book. Motors are listed according to class, five per page, with all necessary data typewritten on the sheet. As sales are made from stock, the items are crossed off. There is always a legible list on the desk, handy for quick reference when a customer calls in. Furthermore the crossed-off entry remains in the book as a handy check-back if a recent customer phones in.

The Champion of all KITCHEN Exhaust Fans

3 speeds • Automatic Operation • Super-powered Motor

VICTOR In-Bilt VENTILATORS

More sales features, greater beauty, better construction, and easier installation—that's what you get in a Victor electric kitchen ventilator. Three models for your selection—for large homes, small homes and for low-cost or speculative type building. Send for new ventilation data book, which shows complete Victor line and gives detailed specifications, prices, and discounts, today!

VICTOR ELECTRIC PRODUCTS, INC.
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Free Data Book Write for Yours Now

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
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MINERALLAC ELECTRIC CO.
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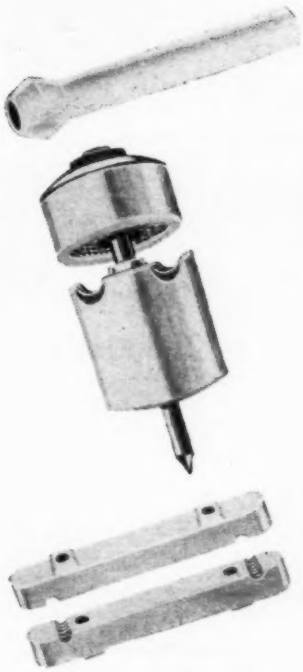
"HOW MUCH?" *or*
"HOW MUCH FOR MY MONEY?"

Are questions best answered by

PORCELAIN

KNOBS • TUBES • CLEATS • OUTLET and SWITCH BOXES • and Many Other Insulating Items



Whether it's a matter of *price* or *value,* Porcelain Insulation is your best business builder and today, more than ever before, closing wiring contracts hinges on one or both of these factors.

PRICE—To prospects primarily interested in the low cost of installation, knob and tube wiring enables you to quote a minimum figure on whatever layout is desired. This means your customer gets *all* he wants . . . and *you* don't lose a thing by it, because knobs and tubes allow the contractor a larger margin of profit on every job.

VALUE—From this standpoint, featuring Porcelain Insulation is the best way to increase your share of the existing wiring business. For the same amount of money another contractor might quote on any other type of installation, knobs and tubes enable you to add extra outlets or offer a more complete and flexible layout without cutting into your usual profit.

In addition, Porcelain Insulated Wiring is acknowledged to be the finest, safest kind of a job . . . Porcelain Insulated Wiring gives the permanent, trouble-free kind of service that increases customer satisfaction and guarantees for *you* first consideration on your customer's future requirements.

On every call you make . . . talk and sell Porcelain Insulated Wiring! Send for the Fact Manual—an instruction booklet on Porcelain insulated wiring which can be used in interviews with architects, home builders and home owners.

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Illinois Electric Porcelain Company, Macomb, Illinois
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Porcelain Products, Inc., Findlay, O.; Parkersburg, W. Va.
Specialty Porcelain Works, East Liverpool, Ohio
Superior Porcelain Co., Parkersburg, West Virginia
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SAVE

Time and Money with Greenlee Tools

Hydraulic Conduit Benders

Greenlee Hydraulic Benders are time and money savers, because they bend conduit quicker and easier than by other methods. In addition, they make smooth, even bends, eliminating many fittings and making it easy to pull in wire and cable. They are simple to operate and are readily portable.

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Greenlee Knockout Punches and Cutters are time savers and profit makers, because they make it easy to enlarge holes in switch boxes, cabinets, etc. They form clean-cut holes quickly and accurately, without reaming or filing.

Other Greenlee Tools

Hydraulic Pipe Pushers **Joist Borers**
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Let us send Complete Information

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Greenlee Tool Co., Rockford, Illinois

Please send complete information on:

☐ Knockout Tools ☐ Conduit Benders

Name.....

Street.....

City.....

State.....

My Jobber is.....EC-7-38

Wires Trucks and Buses

Arnold McLeese of the Battery and Electric Co., in St. John, N. B., is one electrical contractor who has no quarrel with the increasing number of buses or trucks in the maritime provinces of New Brunswick, Nova Scotia and Prince Edward Island. His company has a department that specializes in wiring the new buses and trucks that are built by a local plant which supplies such equipment in that region. Service calls are also handled that involve frequent trips to junction bases of bus and truck lines in these provinces.

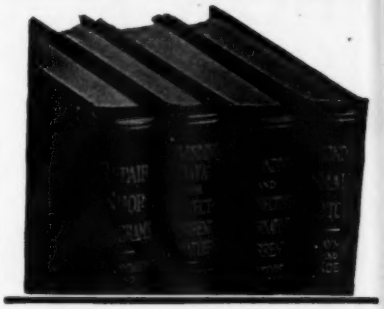
SPECIAL TREATMENT—When A. J. Wolfe wired a large meat provision plant in Boston, special care was taken to seal off switches and other outlets to exclude moisture in damp locations. Maintenance troubles were so well prevented that another meat company recently had the A. J. Wolfe Company do the same kind of trouble-free job in its new plant.

Big Little Job

A two-story, 42-room hotel wiring job, amounting to $70,000 recently came as an unusual experience for the Old Dominion Electric Co., Inc. of Norfolk. John T. Hudgins, rewired the famous Williamsburg, Va., Inn, which was recently restored.

Hazardous Fuels

Propane has become valuable fuel for modern industrial processes, but the electrical man must guard against explosions, says W. E. Frazer of H. B. Frazer & Co., Philadelphia. Tank cars must be securely bonded to thoroughly grounded railroad rails on the siding, and the fuel storage tank and pump motor likewise made explosion proof.



NOW- how to repair and rewind all types of motors . . .

ELECTRIC MOTOR REPAIR LIBRARY

4 volumes, $10.00, payable in easy monthly installments

THIS set of books should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Do you know how to:

—lay out a wave winding
—test a.c. and d.c. motors to locate grounds, shorts, opens, quickly and positively
—properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
—determine how many coils can safely be cut out
—lay out single-phase fan motor windings
—change single-phase windings for two- or three-phase operation
—make cross or equalizer connections on lap windings
—lay out frog-leg windings
—handle every step in a rewinding job from the time it comes into the shop until it leaves
—wind stators for tubogenerators
—band high-speed armatures
—rewind motors for voltage, speed, frequency, or cycle changes
—etc., etc., etc.

1,079 pages of practical shop methods and data on jobs like these in this library. A complete, modern key to repair of all motors. Nothing else in it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results.

Covers all types of motors, from those used in small household and commercial appliances of all kinds, to mining and railway motors. Explains principles underlying the different types of winding; gives definite instructions for doing the various rewinding jobs. Also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

Low price—easy terms—10 days' examination on approval

Bought separately the books in this Library would cost you $11. By using this coupon you need pay only $2.00 in 10 days and $2.00 monthly until the special price of $10.00 is paid. In addition, we give you 10 days in which to examine the books. Send no money; simply fill in and mail the coupon now; let us know your answer after you have seen the books.

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OPPORTUNITY Parking-lot operators need adequate floodlighting. It brings them *extra* customers by attracting motorists who would ordinarily leave their cars on dimly lighted back streets, and it eliminates the petty thievery which often accompanies darkness.

PROFIT You can bring in *extra* profits by selling G-E Novalux floodlighting to parking-lot owners in your community. Lights, poles, wire, switches, and other supplies, together with the actual labor of installation, present opportunities for you to profit from sales which will bring real benefit to your customers.

G.E. CAN HELP YOU Floodlighting installations are easy to make when you use General Electric's complete line of equipment. The G-E distributor or sales office near you will be glad to supply the equipment you need and to make suggestions for its use. Ready supplies assure prompt delivery. Check up on your floodlighting opportunities—and especially at this time, check the parking lots in your community. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

500-300

About NECA

EXECUTIVE COMMITTEE MEETS

The NECA Executive Committee meeting in Chicago, June 14 and 15, heard encouraging reports from all sections on the activities of NECA chapters and membership. Residential, commercial and industrial modernization programs were reported from many cities. The financial position of NECA as given by the operating statements for the first five months of 1938 showed a substantial increase in the National Association's income over the same period in 1937, and nearly 2½ times the income received for the corresponding five months in 1936.

CODE OF BUYING ETHICS

The NECA Fair Trading Policy Committee reported progress toward the establishment of an orderly distribution program through the State Fair Trade and Price Maintenance laws now effective in 45 states and supported by the Federal Tydings-Miller Act. In order to lay the foundation for the successful operation of price maintenance contracts under these state laws, the following "CODE OF BUYING ETHICS" was endorsed by the Executive Committee and recommended for adoption by NECA members:

I believe that the proper distribution of electrical products is from manufacturer to wholesaler to contractor to consumer, and that every branch of the electrical industry should recognize and respect the functions of each of the other branches to the end that an orderly process of distribution be attained, at the same time assuring the public of the best service at the lowest equitable cost.

I believe that the term "electrical manufacturer" means any person, firm or corporation engaging in the business of manufacturing electrical products.

I believe that the term "electrical wholesaler" means any person, firm or corporation whose principal business is wholesale distributing of electrical products; who maintains a regular place of business for the warehousing, sale and distribution of electrical products at wholesale; who carries a general stock of electrical wiring supplies and maintains a regular sales force including outside salesmen whose sole duty is to solicit business from retailers, contractors and other purchasers at wholesale; and who does not obtain recognition as an electrical wholesaler for the purpose of securing wholesale prices for the benefit of its own or any affiliated business engaged in installing, retailing or consuming such electrical products.

I believe that the term "electrical contractor" means any person, firm or corporation engaged in the business of erecting, installing, servicing or maintaining electric wiring, devices, appliances or equipment, including the purchasing from suppliers and the selling of electrical products to consumers for use.

I believe that the term "electrical retailer" means any person, firm or corporation selling electrical products to consumers for use.

I believe that the term "consumer" means any person, firm or corporation who purchases electrical products for their own use and not for resale.

I believe that it is necessary for each electrical manufacturer to set up schedules of prices on his own products for the consumer, with proper differential steps for quantity purchases; to set up corresponding schedules of prices for contractractors, retailers and central stations, with a price differential for the functions of those branches over the consumer at each quantity step; and to set up corresponding schedules of prices for wholesalers with a price differential for the functions of the wholesaler over contractors, retailers and central stations at each quantity step.

I believe that when a substantial number of the individual electrical manufacturers of any electrical products shall have set up such individual schedules for their products and shall have individually undertaken to maintain such schedules, it becomes my duty to the industry and to my individual business:

First: To use proper quality products of the electrical manufacturers who set up and maintain such schedules of prices; and

Second: To purchase these products through electrical wholesalers who maintain the schedule of prices set up by the individual electrical manufacturers, and who conduct their business ethically.

I believe that it is my duty not only to confine my purchases to such products and sources of supply, but to further assist by myself maintaining the price schedules set up by the individual manufacturers.

LABOR RELATIONS PLAN

The Executive Committee adopted this resolution in regard to loan relations:

Whereas, the Executive Committee was authorized by the Los Angeles Convention to receive from a special Labor Relations Committee empowered by the convention, and to pass upon a plan with reference to labor relations, which plan has been received as embodied in a report of such Committee; and

Whereas, the Executive Committee acknowledges the right of any group of members who are exclusively employers of labor members of a single labor organization of their own choosing to set up a Labor Relations Committee to deal with the labor relations of such members; and

Whereas, the plan submitted in the report of the special committee is confused with methods of administration and recommendations not authorized by the resolution of the convention, and not permissible under the Wagner Labor Relations Act for action by the Association as a whole;

THEREFORE, BE IT RESOLVED, that the Executive Committee considers the following to constitute the plan as embodied in the report:

1. A Labor Relations Committee, representing members exclusively employing members of the International Brotherhood of Electrical Workers, shall be set up within the National Electrical Contractors Association.
2. This Labor Relations Committee shall be composed of twelve (12) members, one member from each of the geographical divisions of the Association.
3. Qualification of a member of this Labor Relations Committee shall require that he be a member of NECA who is an owner, partner of a firm or active officer of a company which exclusively employs members of the International Brotherhood of Electrical Workers.
4. Members of this Labor Relations Committee will be nominated and balloted for only by NECA members exclusively employing members of the International Brotherhood of Electrical Workers within their respective divisions. Members of the Executive Committee qualifying under Paragraph 3, shall automatically become candidates for membership on this Labor Relations Committee in their respective divisions.
5. This Labor Relations Committee shall be empowered to deal only with the labor relations of NECA members exclusively employing members of the International Brotherhood of Electrical Workers, as they may be directed or empowered by such NECA members.
6. The support of the activities of this Labor Relations Committee shall be from the general funds of the Association.

BE IT RESOLVED, That the Executive Committee approves the above plan, except that the finances of the Association will not permit of unqualified approval of Paragraph 6. The Executive Committee, however, is in favor of and approves the allocation of a sum not to exceed $1,200 for the activities during 1938 of the Labor Relations Committee, and after January 1, 1939, to allocate to a special fund for use of the Labor Relations Committee 50 per cent of the annual dues in excess of $35 paid by any member exclusively employing members of the International Brotherhood of Electrical Workers.

BE IT RESOLVED FURTHER, that this resolution and plan with reference to labor relations be referred to the Chapters and membership for ratification.

CONFERENCE ON REA WORK

Following the meeting of the NECA Executive Committee, an all-day conference of electrical contractors engaged in building REA projects, together with manufacturers and wholesalers, who sell line materials, was held at the LaSalle Hotel, Chicago on June 16, 1938. The conference was attended by 65 delegates, and the electrical contractors present represented the building of approximately 25,000 miles of REA lines.

From this conference there developed a constructive report of the difficulties encountered by electrical contractors in the execution of these REA contracts. A committee was appointed to accompany Earl N. Peak, president of NECA, in presenting this report to REA administrator John Carmody.

THE UNSEEN HAND

Sterling Reflector Photo

. . . that makes this type of installation

Completely Automatic

Your customer may be pleased with the effect of his window lighting installation, but the operation of these lights remains a problem until the Unseen Hand is on the job. A little extra selling effort on your part to acquaint him with the convenience and economy of automatic control — and another Sangamo Time-Switch will become a faithful and punctual employee.

New SYNCHRONOUS TIME SWITCH

Continuous operation due to the ten-hour carry-over feature of new Form VSW eliminates resetting clock after current interruptions.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

BETTER LIGHTING
with
MULTI REFLECTORS

★MULTI Two-Piece Dome Reflector has snow white diffusing glass globe held in place by MULTI quick-changing Grip-It holder with internal finger support. No breakage from vibration or expansion. Ideal for efficient lighting of factory, workshop, or office.

★MULTI Industrial Reflectors are made in hundreds of sizes and types to meet the demand for efficient and correct lighting. Rustproof and easily cleaned. Specify MULTI for new and replacement work.

Write for catalog.

MULTI ELECTRICAL MFG. CO.
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"VISE TITE"
— a NEW, BETTER WIRE CONNECTOR

A *tapered* thread makes the connector *VISE TITE* and trouble-free. Simple, double-protection, economical. WRITE FOR FREE SAMPLE

WILL TAKE
Two or three No. 12 and one No. 18 Wires.
Three No. 12 Wires.
Two No. 14 and either one No. 18 or 16 Wires.
Three No. 14 and either one No. 18 or 16 Wires.

Patent Pending

M & M COMPANY
21 MUIRHEID AVENUE
TRENTON, NEW JERSEY

Selling Light To the Bakery

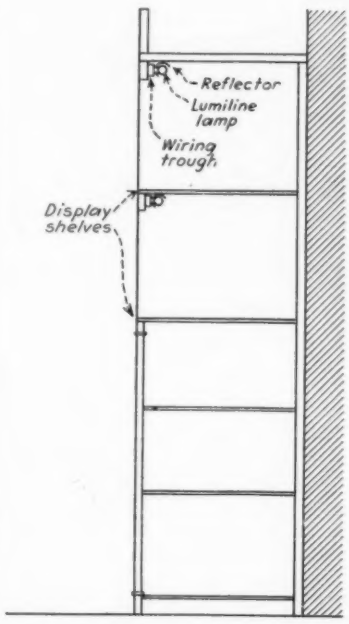
[FROM PAGE 17]

Fermenting and proofing—In bread making, the bulk dough is allowed to "raise" or ferment in a humidified room or cabinet. Sufficient lighting for rough inspection is all that is needed for this process. RLM reflectors, with vapor proof globes and lamps of sufficient wattage to provide ten foot candles are recommended.

"Proofing" of individual loaves after "dividing", "rounding" and "moulding" is usually handled in mechanical proofers and proof boxes. These are timed processes requiring lighting only for routine inspection, cleaning and maintenance. Enough light for this operation is usually provided by the general illumination in the shop or lights built in by the manufacturer.

Dough mixing, dividing, rounding—These are usually machine operations in bread making. Cakes and cookies are still widely prepared by hand in the smaller shops. Larger wholesale bakeries are equipped with more machine operations. However, few critical seeing tasks are involved in either case. General lighting of 15 to 20 foot candles will usually provide sufficient working illumination. Such intensities will also give a bright general appearance where the shop is a show place visible from the street or the retail salesroom.

Ovens—Peel type baking ovens are usually illuminated by built-in lighting units furnished with the original equipment. As this process is usually timed, enough light for occasional visual inspection is sufficient.

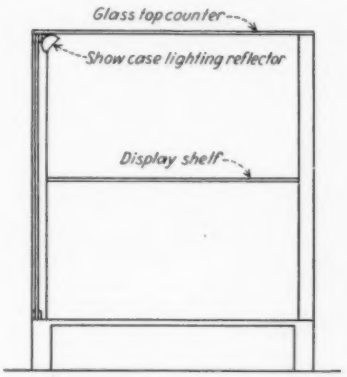


WALL CABINETS *with open shelving need supplementary lighting to draw attention to the displays. Show case strips or lumiline lamps in close reflectors will do the job.*

Lighting units in common use provide approximately 5 foot candles within the oven.

Inspection and wrapping—Machines for slicing and wrapping have replaced hand work in even smaller bakeries. However, in this department the "cripples" are discarded and loaf color and general appearance is checked. This is the last line of defense in maintaining product quality and good lighting is essential. Intensities from 20 to 28 foot candles are recommended.

Retail store—The application of better light for the retail store involves good general lighting, local showcase and cabinet lighting and high intensity window lighting. General illumination of 25 foot candles is recommended, with supplementary lighting up to 50 foot candles at the showcases. The general lighting units should provide efficient and well distributed illumination without glare. If direct lighting enclosing globes are used, they should be mounted high enough to avoid distracting attention from the displays. Semi-indirect types and full indirect types may be used when ceiling and side walls have a high reflection factor.



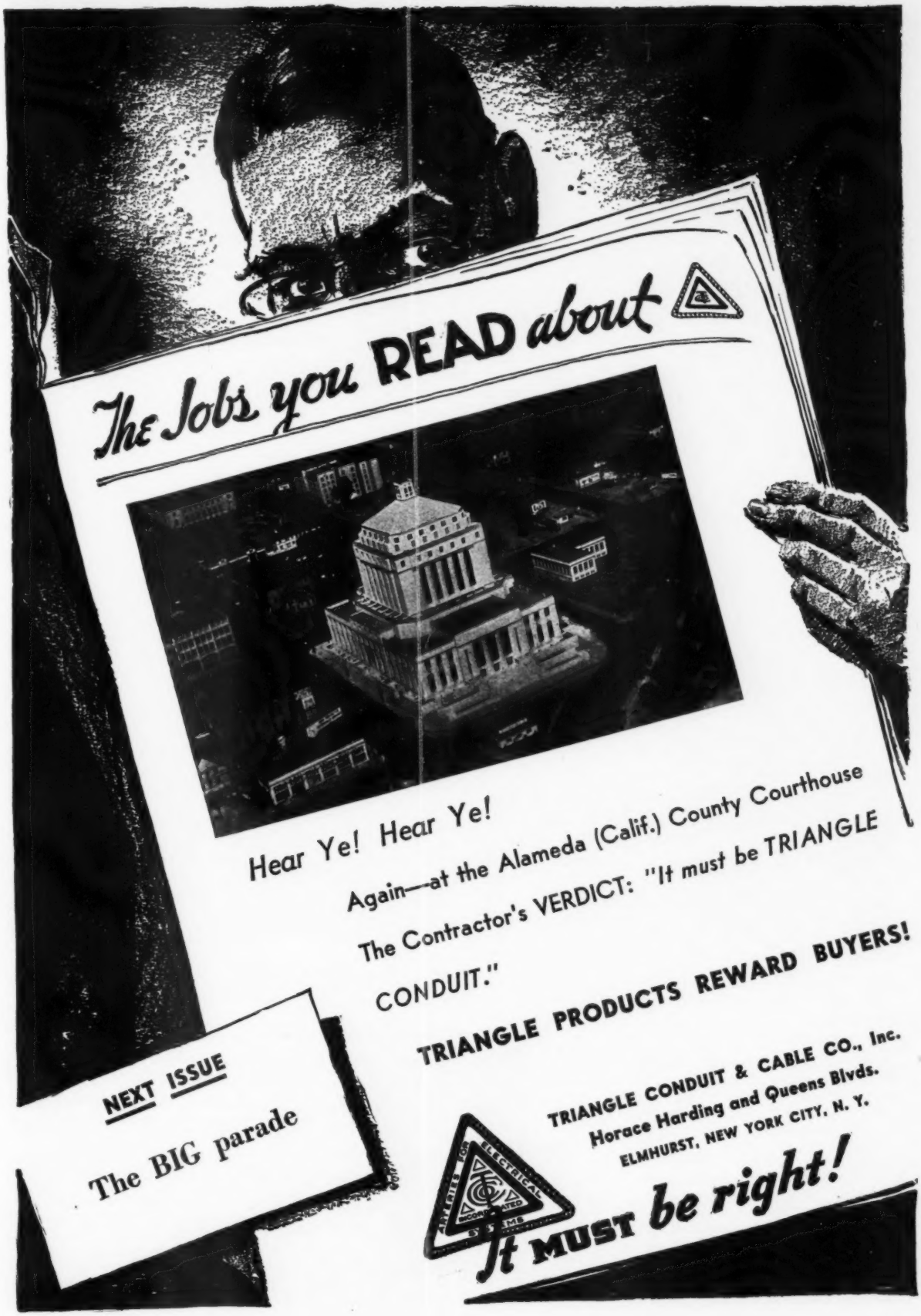
SALES COUNTERS *with glass tops may be lighted with neat show case lighting strips in the upper front corner providing 25 to 40 watts per running foot.*

Window lighting of 150 watts per foot in high efficiency reflectors, with supplementary louvered spotlights for special displays, will prove adequate for most neighborhood stores. When the bakery is located in a "bright light" district, however, a careful analysis of the window lighting in adjacent stores should be made before final recommendations are presented.

The accompanying diagram shows a typical bakery with lighting units laid out to give the results recommended in this article. In applying these standards, it will be necessary to fit the lighting layout to the prospect's plant. If the spacings, heights and unit types as shown are used, the contractor can be certain of a good lighting job.

Stock in Trade

One of Canada's really large motor shop organizations, the Montreal Armature Works, Ltd., carries the statement "40,000 Horsepower in Stock" in its telephone directory display ad. W. A. Landry, genial manager of this company wants the public to know the facts as to his ability to meet emergency orders.


The Jobs you READ about
Hear Ye! Hear Ye!
Again—at the Alameda (Calif.) County Courthouse
The Contractor's VERDICT: "It must be TRIANGLE CONDUIT."
TRIANGLE PRODUCTS REWARD BUYERS!
NEXT ISSUE
The BIG parade
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
It MUST be right!

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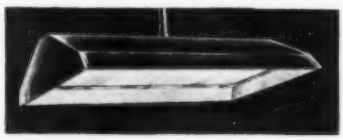
EQUIPMENT News

Industrial Lighting Fixture

Industrial lighting fixture No. 66 provides high intensity illumination, controlled and diffused to eliminate glare and reflections on working plane. For use in textile mills, printing plants, assembly lines, sorting operations and all close work in industrial plants. May be used as individual units or connected together to form continuous line. Day-Brite Lighting, Inc., 5401 Bulwer Ave., St. Louis, Mo.



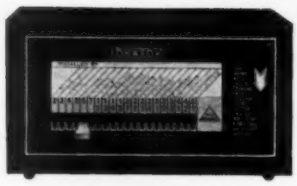
DAY-BRITE LIGHTING FIXTURE

■

IDEAL WIRE STRIPPER

Wire Stripper

A new motorized brush type wire stripper, designed for rapid, fine wire stripping. It cleanly strips cotton, silk, enamel, string asbestos covered wire, or fine "Litz" wires, and removes gummy insulation embeddied in stranded wires. Suitable for stripping rectangular or square conductors. Driven by a ½ hp. motor. Heavy metal guards in front of revolving wire brushes and over driving belts protect operator's fingers. Thumb adjustment screw varies distance between brushes for various sizes of wire, while an adjustable stop behind brushes fixes length of stripping. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Illinois.



EDWARDS "LOKATOR"

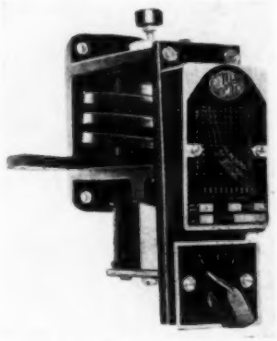
Code-calling Device

Lokator is an automatic, motor driven, code-calling device, standardized to prevent necessity of special jobs. Available in standard 20-call model or in models in multiple of twenty. Operator does not have to remember code numbers. All names are written or typed on a cellophane protected strip. Selector slides beneath the names. Lokator may be placed on key shelf, on top of switchboard or on a shelf or table at side of board. Operated by low voltage irrespective of voltage used to operate signals. Edwards & Company, Norwalk, Conn.

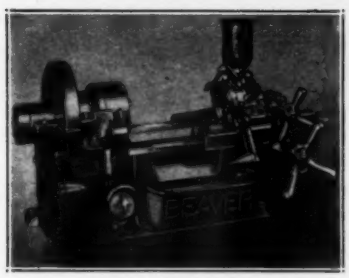
■

Trip Attachment

Type DTA thermal-magnetic trip attachment for types BD and HD air circuit breakers for the protection of a.c. circuits. Permits high currents to flow for a safe period but trips breaker before a dangerous temperature is reached. If current is high enough to indicate a defect in circuit, tripping occurs instantly. Suitable for protection of all a.c. circuits and recommended particularly for motor circuits to prevent tripping on starting currents. Roller-Smith Company, 233 Broadway, New York.



ROLLER-SMITH TRIP ATTACHMENT

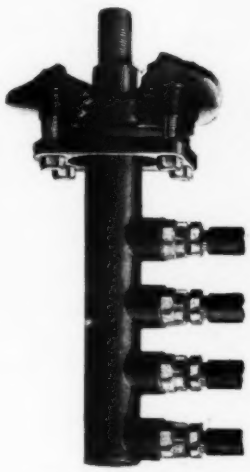


BEAVER PIPE MACHINE

Pipe Machine

Model-B pipe and bolt machine is right-handed, like a lathe. Cuts, threads and reams nine sizes of pipe from ¼ to 2-in. With a drive shaft and geared tools, will cut and thread 2½-in. to 12-in. pipe. Cuts off solid bolt rounds up to 1-in. All-gear-driven—no belts. Equipped with standard all-steel geared chuck and automatic chuck wrench ejector. Self-cleaning as chips and oil fall, by gravity, into removable trays on either side of machine. Trouble-free reservoir provides adequate bath of flowing oil to dies. Machine may be purchased complete or in units. Beaver Pipe Tools, Inc., Warren, Ohio.

■



BURNDY STUD MOLE

Stud Mole

Stud mole, Type XMLD, is a combined insulated multiple terminal and bushing that replaces porcelain bushings and gaskets on network protectors used in underground distribution. It is designed to provide multiple connections in small space and to seal out moisture and gases encountered in underground vaults. Can be used with all types of cables—leaded or non-leaded. May also be used for making multiple terminal connections on distribution transformers. Burndy Engineering Co., Inc., 459 East 133d St., New York City.

New Residential Switches

Just what today's market invites! — a high-grade line priced *in-between* your high- and low-cost switches . . . Now, modest jobs can be *adequately* wired with switches of adequate *quality.*

Switch-bases are small, completely enclosed, substantially made of Bakelite. Solid Bakelite neck and operating lever. Show-parts of brown Bakelite, or cream-tinted white IVORYLITE. The sturdy mechanism has self-aligning contacts. Wide, reinforced mounting strap adds rigidity. Large binding screws accommodate No. 10 wire. Bases only 1″ deep, 1½″ long, ⅞″ wide, allow generous wiring room in any switch box.

Listed as standard by Underwriters Laboratories:— rated 10 Amp., 125 V.; 5 Amp., 250 V. No. 1881 is single-pole; No. 1883 3-way. (For IVORYLITE add "I" to catalog numbers above). Your request brings a *free sample* — promptly.

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THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

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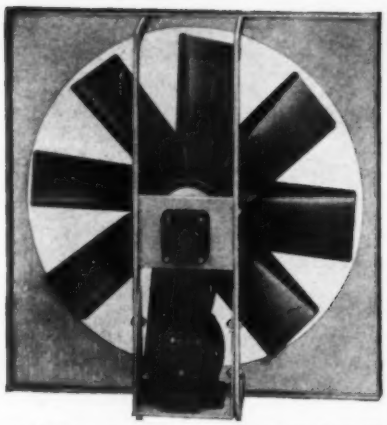

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★ Many other allied selling organizations such as oil burner, stoker, and coal dealers are going after and "landing" profitable fan sales. Every industrial or residential installation in your territory is a prospect for YOU! ★ Attic Fans, Kitchen ventilators, circulating fans are all BIG SELLERS this summer! The COOLVENT comfort cooling fan (pictured above) leads the field! ★ Write for catalog, specification sheets, performance data and money making proposition —NOW!

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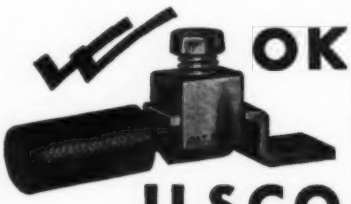


OK

ILSCO

SOLDERLESS CONNECTOR

NO SPECIAL TOOLS REQUIRED TO MAKE CONNECTION

ILSCO solderless connectors eleminate need for special tools, thereby providing faster, permanent connections. Other ILSCO features:

NO set-screw contact . . .

NO flattening or separating of stranded wires

NO limitation to one size wire . . .

NO shearing effect whatsoever . . .

NO need for you to search any longer for the PERFECT Solderless Connector . . . WE HAVE IT! Six Sizes Take Care of All Wires from No. 14 to 1,000,000 C.M.

FREE—A large display board bearing mounted samples of ILSCO lugs. Address Dept. EC

ILSCO COPPER TUBE & PRODUCTS, INC.

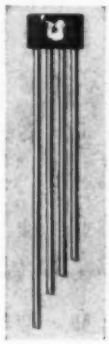
5629 Madison Road, Cincinnati, Ohio

EQUIPMENT News

[FROM PAGE 62]

Door Chime

The Ambassador model electric door chimes play the eight notes of the Westminister chimes. Also available are two additional single-note signals for rear door and maid calls. Operates on alternating current on transformer supplied with chime. Model A-400 is 52-in. long by 10-in. wide, chime tubes are 1½-in. in diameter. Model A-500 is 60-in. long by 10-in. wide, chime tubes 1¾-in. in diameter. Designed for surface mounting. The A. E. Rittenhouse Co., Inc., Honeoye Falls, N. Y.

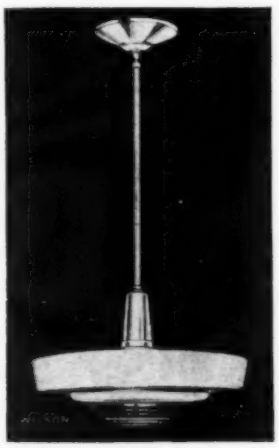


RITTENHOUSE DOOR CHIME

■

Lighting Fixtures

A new series of luminous bowl indirect fixtures for use in locations where even, shadowless qualities of indirect lighting are desired. Model No. 770 shown has an open louvred bottom for projecting high intensity direct light downward on merchandise displays and counters without diffusion through glass. Can also be supplied with mirrored glass reflector bowl. Louvred bottom type uses 200–300 watt lamp and indirect mirrored bowl type a 300–500 watt lamp. Wilson Fixture & Mfg. Co., 411 S. Clinton St., Chicago, Ill.



WILSON LIGHTING FIXTURE

ZENITH ELECTRIC TIMER

Clock and Process Timer

This synchronous program clock and process timer has a large 24-hour dial and a 1-hour dial cam. Two pointers ride each dial connected with electrical contact arm. Four types are available—Type P-24 gives time periods and signal operates 5 seconds, or as predetermined. With Type P-524 time periods can be changed at any time. Type P-24A and Type P-524A have adjustable operating period of 1 to 15 seconds. Zenith Electric Co., 607 South Dearborn St., Chicago, Ill.

■

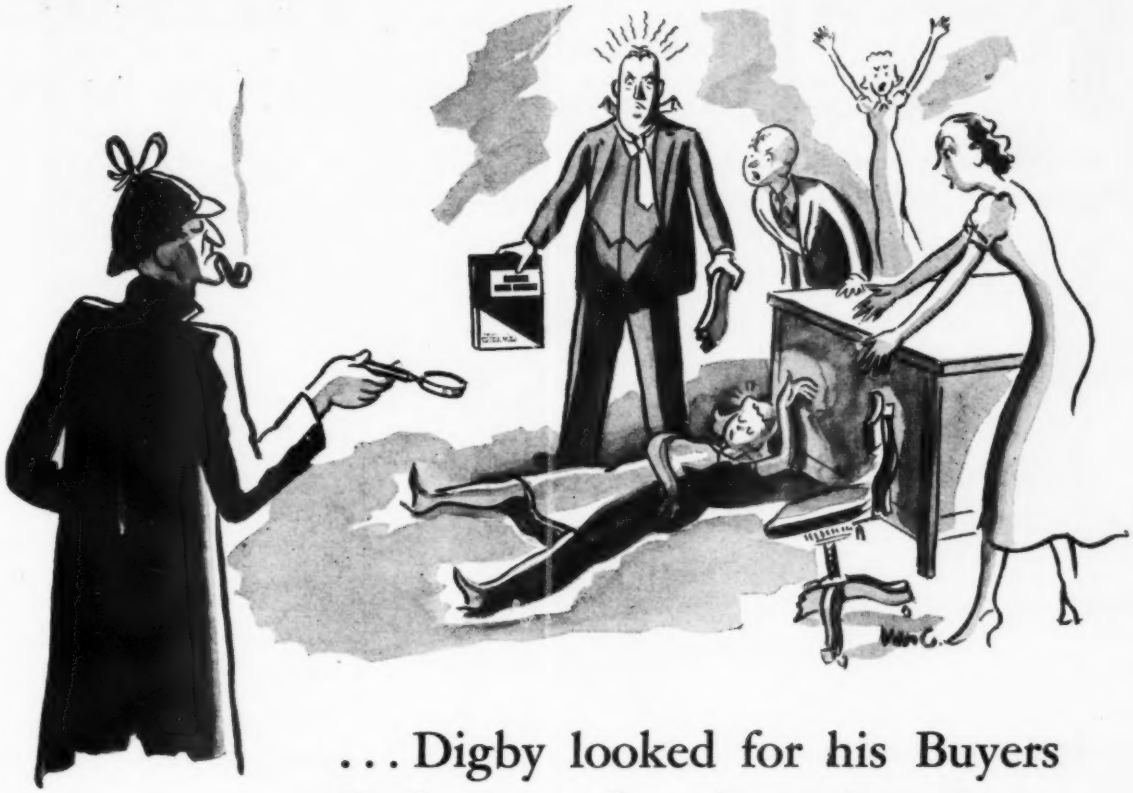
RAYTHEON VOLTAGE REGULATOR

Voltage Stabilizer

This automatic voltage regulator corrects varying voltage conditions and provides constant a.c. voltage for operation of many electrical devices. Regulator will stabilize at any load within rating and may be used as an accessory to equipment already installed. It is a magnetic device without moving parts or adjustments and can be made to operate from any commercial a.c. power source and deliver one or more required voltages with power outputs up to several thousand voltamperes. Some of the types of equipment which are benefited are X-ray machines, color comparators, photo-print devices, photometers, amplifiers used in talking motion pictures, radio transmitters and telephone apparatus. Also widely used by laboratories making electrical experiments and for general use. Raytheon Manufacturing Co., Waltham, Mass.

UMI

"Justifiable homicide, Watson...



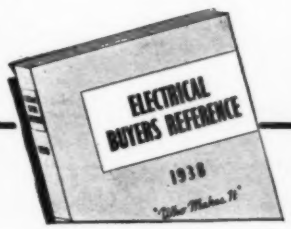
...Digby looked for his Buyers Reference for three hours... *...she was sitting on it"*

Too bad. Sally was a good stenog. But she was short — and that big blue and orange Electrical Buyers Reference brought her up to desk level.

Of course she didn't know that the Buyers Reference was old Digby's right arm when it came to buying. He uses it constantly to look up manufacturers of electrical and allied products.

Don't sit on *your* copy of the Electrical Buyers Reference. Use it to get buying information — it will save you time and money!

The Looking-Up-Place for Everything Electrical



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PERFECT JOINT

Make your connections the modern, easy way. No messing with solder — A screwdriver and a twist is all you need with the MARR.

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GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.

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A complete line of thoroughly dependable quality time switches with innumerable exclusive features, giving you more time switch sales opportunities.

For 28 years the name of Reliance has stood for the best in the time switch field. A good line to handle because profits are not eaten up by expensive come-backs.

See your wholesaler or write for complete descriptive literature

RELIANCE AUTOMATIC LIGHTING CO.
1937 MEAD STREET RACINE, WIS.

EQUIPMENT NEWS

[FROM PAGE 64]

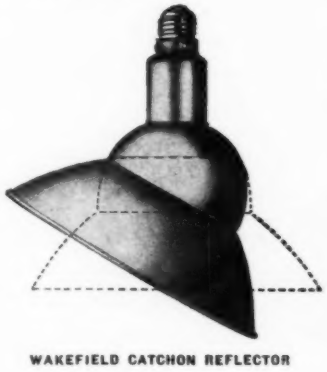
Indoor Oil Circuit Breaker

Indoor oil circuit breakers designed for industrial and central station use, where minimum space is available. Manually or electrically operated, non-automatic or automatic, single throw with adaptable mounting arrangements. All levers enclosed within tank and top. Breakers are rated 50,000 kv-a interrupting capacity; 600-amp, 15 kv; 1200-amp. 7.5 kv; and 200-amp, 5 kv; 2 and 3 pole single throw. Double pole breakers obtained by omitting center pole of a three-pole breaker. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

WESTINGHOUSE CIRCUIT BREAKER

Window Reflector

Catchon Window reflector has been designed for use with standard 150-watt lamps and recommended for building up intensities in present installations. Reflector shell is adjusted so light can be directed to any part of window display. This feature permits use in sockets which lie in either horizontal, vertical or any intermediary position. No wiring or auxiliary equipment required. Reflectors screw into existing sockets. Lamps of 100-watt can also be used in reflector in smaller store installations. F. W. Wakefield Brass Co., Vermilion, Ohio.



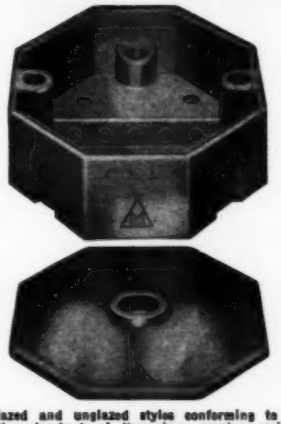
WAKEFIELD CATCHON REFLECTOR

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES



★Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
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For Better Service—
INSTALL
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TRICO PRODUCTS have always been built to give the ultimate user a lasting money-saving investment. Today those who know, say: "If it's TRICO—it's good."
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New TRICO FOLDER CPF-300 gives complete details and valuable information. Send for your copy TODAY!
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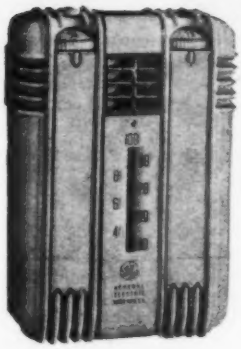
STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS



G. E. HUMIDISTAT

Control Devices

A new humidistat, for controling humidifying apparatus in residential field, may be installed separately or in combination with a thermostat or night-and-day assembly, with heating and air conditioning equipment. Consists of a multiple human hair element, electrical contacts and magnet to cause snap action on opening and closing of contacts. Includes a rotating dial calibrated for a range from 20 to 60 per cent relative humidity. A single-pole, single-throw, two-wire contact blade opens on relative humidity rise and closes on relative humidity drop. Suitable only for low voltage. To control both humidity and temperature, a time switch is used which automatically changes from specified day temperature to specified night setting and back again, at a predetermined time. General Electric Company, Bloomfield, N. J.

■

WAGNER HIGH TORQUE MOTOR

Motor

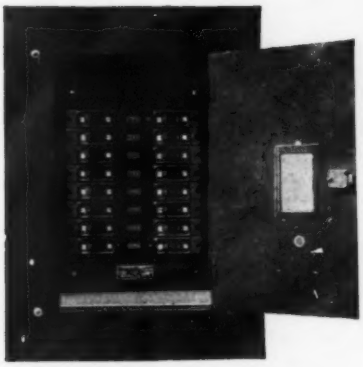
A new high-torque double-capacitor motor has been added to the Wagner line of single-phase motors. Available in 110/220-volts in sizes ½, ½, ¾ and 1 hp. ratings. Designated as type RSN, when equipped with rigid mountings, and type RSNR, with annular resilient mountings. Has two condensers—a high value of capacitance for starting and low value of capacitance for running. The features are high starting torque, low starting current, smooth-running characteristics, quiet in operation, good power factor and efficiencies. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

MR. A. CONTRACTOR

SAYS — "I STAY RIGHT WITH **WURDACK EQUIPMENT** *AND THE RESULTS ARE ALWAYS RIGHT"*

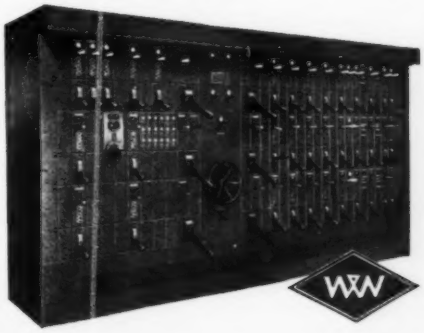
WURDACK PANELBOARDS

A complete line of Dead Front Lighting Panelboards, constructed of standardized sections of moulded Bakelite. All switches and fuse receptacles are readily removable from front of panel. All Cabinets made of Code Gauge Galvanized Steel. Fronts of full finished cold rolled steel with black lacquered finish.



CIRCUIT BREAKER PANELS

Are made in three general types. No. 1, for Branch Circuit Lighting. No. 2, Narrow Distribution Type. No. 3, Convertible Distribution Type. All panels are constructed with individually inclosed inverse time limit overload Thermal Circuit Breakers. Design of all panels is such that individual breakers may readily be removed from panel.



WURDACK REMOVE CONTROL STAGE SWITCHBOARDS

Are designed for all types of Theatres, Auditoriums, Fraternal Buildings and Schools where a modern system of lighting control is desired. Outstanding features are simplicity of design, convenience of arrangement and ruggedness of construction. Each installation is carefully engineered to meet its peculiar requirements.

Investigate this line now—see why they are easy to install, why they stay in service and why they are always dependable. There is the right size and design for the job. Wurdack is the right answer.

WM. WURDACK ELECTRIC MFG. CO.

4444 CLAYTON AVE., ST. LOUIS, MO.

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When you install

WURDACK EQUIPMENT

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* THE UTMOST IN CONVENIENCE
* COMPLETE DEPENDABILITY
* ALL AROUND SATISFACTION

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GEDNEY

Fine FITTINGS

A new line of electrical fittings, designed by old-timers in the electrical business. Tested and proved in every detail. If your wholesaler cannot supply the GEDNEY LINE, write direct for details and prices.

Sole Sales Agent

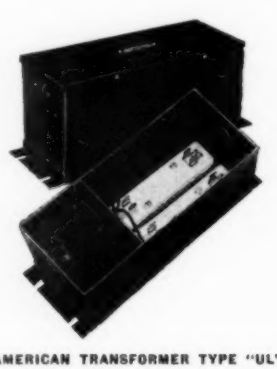
MERON ELECTRIC SALES CORP. RCA BLDG., NEW YORK

EQUIPMENT NEWS

[FROM PAGE 67]

Transformer

Type "UL" transformer for individual lighting of machines. Eliminates separate lighting circuits, drop lights and excessive general illumination. Mounted on machine, its input terminals connect to high-voltage power circuit at motor disconnecting switch, making low voltage for lamps available at output receptacle of transformer. When motor is disconnected lighting at that machine it automatically turned off. Units available for use where power-circuit voltage is 115, 230, 460 or 575 volts. Units equipped with built-in fuse block connected in either high or low-voltage line, knock-outs for input (line) connections and either receptacle or knock-outs for low-voltage (lamp) connections. American Transformer Company, 178 Emmet St., Newark, N. J.



AMERICAN TRANSFORMER TYPE "UL"

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Ground-Ohmer

Model JP Ground-Ohmer for measuring ground resistance of lightning arrester grounds, transmission tower footings, transformer grounds. This instrument is available in five different range combinations—10 and 100 ohms, 10,000 and 1000 ohms, and 100, 1000 and 10,000 ohms, latter made up with or without fourth terminal for geophysical measurements. Herman H. Sticht & Company, 27 Park Place, New York.

STICHT MODEL JP GROUND-OHMER

Lighting Unit

The new lighting unit know as "Storlite" is designed for store lighting. A direct-indirect unit, it illuminates the ceiling, for general illumination, and provides a maximum light on the merchandise. Highly translucent white thermo-plastic louvers, consisting of four rings mounted in a hinged frame together with outer reflector, spread light over a wide range. Louvers are arranged so that inside of reflector is invisible at normal angles of sight. Two types available; standard with plain reflector assembly or a deluxe type with lower ornamental band. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

WESTINGHOUSE STORLITE UNIT

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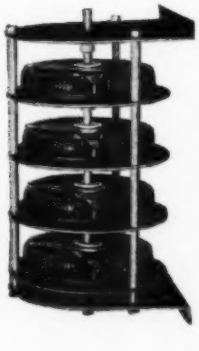

OHMITE RHEOSTAT

Tandem Rheostat

This rheostat tandem assembly is used for control of electrical apparatus where several circuits are to the simultaneously varied as in the control of individual phases of a 3-phase line. A four-unit assembly consists of 4 Ohmite Model "U" rheostats rated at 1,000 watts each. Overall length is 3 ft. 2 in., height 15⅛ in., diameter 12 in., shaft ¾ in. mounted on rigid framework with separate bearings on end plates. Each rheostat individually driven. Furnished for 2, 3, 4 or more rheostats in tandem using any combination of moled "N", "R" or "U" units from 25 to 1,000 watts. Ohmite Manufacturing Co., 4835 Flournoy St., Chicago, Ill.

CRAMER INTERVAL TIMER

Interval Timer

This interval timer is applicable to a wide variety of machines, appliances and equipment operative on a pre-determined time basis. Driven by slow speed, self starting synchronous motor. Available with normally open, normally closed or double throw contacts. One minute maximum time scale, with dial divisions in single seconds. Optional features are automatic stop and delayed start button. R. W. Cramer & Company, Inc., 67 Irving Place, New York.

■

BENJAMIN

LIGHTING

EQUIPMENT

Lighting Equipment

This "Turnlox" hood permits reflector and lamp to be cleaned without use of ladders or necessity for getting off the floor. Hoods are also available for use on older installations employing regular "Turnlox" reflectors. The reflector changer is a light weight shaft that permits operator to remove and replace fixture at heights up to 18 feet. Electrical and mechanical connections are made with socket through a three point, self centering, bayonet lock. Socket hoods have porcelain terminal bases which fit any medium size or mogul base "Turnlox" reflector assembly. A complete line of reflectors is available with floor-service construction feature. Benjamin Electric Mfg. Co., Des Plaines, Ill.

ROME-CABLE

BUILDING WIRE

UP-ping PROFITS

Wire and cable which can "take it" and "stand the gaff" brings you new customers and insures you of reorders. Every inch of ROME CABLE wire and cable is rigidly inspected and made from the finest materials, thus insuring uniformity of gauge, temper, insulation, finish, and package. That's why you can depend upon Rome Cable products to build repeat orders and send your profits skyward.

ROME CABLE QUALITY

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Approved by the Underwriters' Laboratories, Inc. N.E.C.S.
Flame & Moisture Resistant
Slick finish for Quick and Easy Pulling
Long Aging Rubber Uniformly Small Diameters
Clean—Easy Stripping
Eight Clear Distinct Colors

ROME CABLE CORP.

ROME, N.Y.

PRODUCTS

Hot rolled rods, bare and tinned copper wire, bare and tinned strand, U.R.C. weatherproof wire, cotton, paper and asbestos magnet wire, rubber insulated wires and cords, lead covered cables.

SALES OFFICES

New York, Chicago, Philadelphia, Pittsburgh, Richmond, Cleveland, Boston, Dallas, Los Angeles.

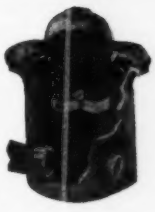
LATROBE

FLOOR BOXES and

WIRING SPECIALTIES

No. 330 "LATROBE" TOM THUMB UTILITY OUTLET

For use in wood installations, and other locations free from moisture or mechanical injury.



No. 110 "LATROBE" WATERTIGHT BOX

Cut-away view of No. 110 Box showing how the tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

Sell and install LATROBE—the complete line for residential, commercial and industrial work.

Catalog on request

FULLMAN MFG. CO.

LATROBE · PENN.

No. 285 DOUBLE DUPLEX RECEPTACLE NOZZLE

The most attractive, compact and easy-to-install fitting on the market. Shown in illustration with No. 200 Cover Plate.

UMI

New

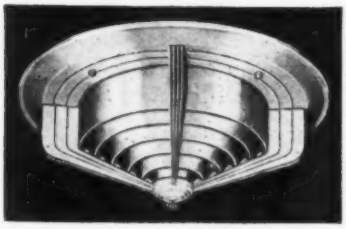
Signal 16 inch Oscillating Adjustable Floor Model Pedestal Fan

Easily moved about, and adjusted to the desired height for the room—adjustable from 4 ft. 6 in. to 7 ft. 6 in. from floor to center of fan . . . 16 inch quiet type polished aluminum fan blades . . . Rotary type switch, 3 speeds . . . air displacement 1650 r.p.m. . . . induction motor, non-radio interfering. This is Signal P-1250-A fan, list price $33.75. Prepare now for calls for this new fan. Complete details upon request.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan
Offices in all principal cities

SIGNAL

Store Lighting that SELLS



Merchants know that the marvelous illumination afforded by Ster-Lite Louver-Controlled Direct-Lighting Units really helps in selling merchandise.

And Contractor after Contractor has found that STER-LITES are a big help in landing profitable store lighting jobs.

Get facts and figures about STER-LITE Performance.

Sterling

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STERLING REFLECTOR CO.
1435 W Hubbard St CHICAGO

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What prospects think is largely a matter of impressions given by business cards. For business cards can stay long after salesmen have gone and been forgotten.

Expense is a minor item, if you have salesmen's business cards done by Wiggins Vellotype. For this ultra-modern process needs no plates. *Skill* by Wiggins craftsmen makes it worth far more than its nominal cost.

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Vellotype Business Cards
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THE JOHN B. WIGGINS COMPANY
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CO-OP ELECTRIC SUPPLY CO.
812 W. Jackson Blvd., Chicago, Ill.

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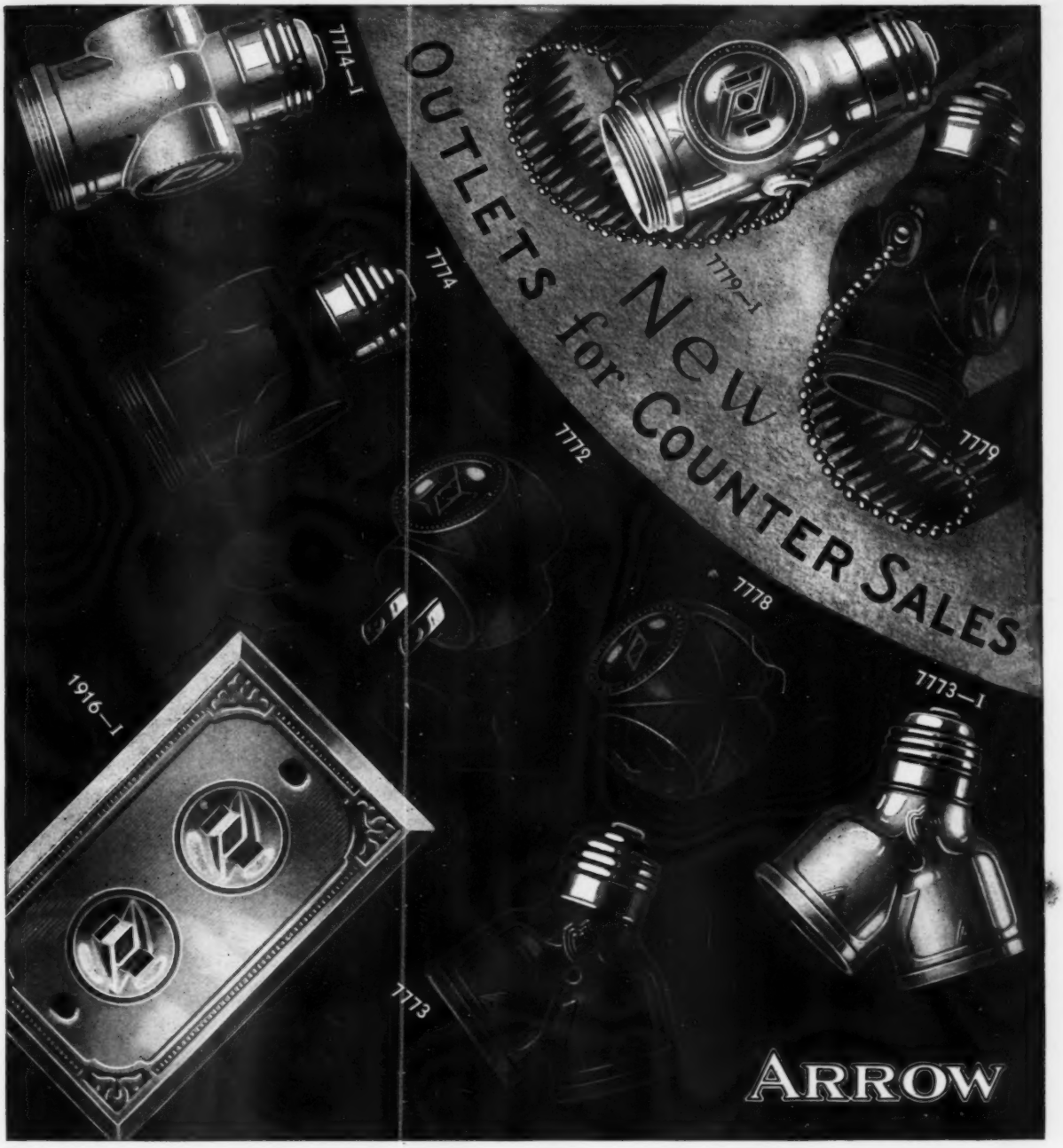

Now presented in white IVORYLITE — as well as brown Bakelite — this assortment of taps, socket and plug devices has a fresh appeal over the counter.

Newly added to the line is the handy Pull Current Tap No. 7779, in the cream-tinted white IVORYLITE and brown Bakelite. Pull chain controls the lamp outlet; the double plug outlets are connected in multiple.

Another feature number is 1916 — Plate and Duplex Receptacle Unit molded in *one piece* — now available in IVORYLITE or brown Bakelite. Quickly installed; attractively priced, this number is a fast mover on the counter.

Taken in all, here's a hand-picked group, nicely made yet *competitive priced,* to corral those profitable counter sales now attracted elsewhere.

Write for catalog data-sheet listing the line COMPLETE.

SOLD THROUGH YOUR **ARROW ELECTRIC DIVISION** ELECTRICAL WHOLESALER

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

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The Jobs you READ about
GOLDEN GATE BRIDGE
Spanning San Francisco's Great Harbor.
TRIANGLE CONDUIT ON THE WORLD'S LARGEST AND LONGEST SUSPENSION BRIDGE
A Triangle Product rewards the Buyer
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
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TRIBORO BRIDGE
Connecting three boroughs of Manhattan
It MUST be right!

The Jobs you READ about
TRIBORO BRIDGE
Connecting three Boroughs of NEW YORK CITY
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SELECTED AGAIN!
TO SERVE SEVERE REQUIREMENTS
A Triangle Product Rewards the Buyer!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvds.
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It MUST be right!

CONCLUSIVE PROOF THAT

A "sum-up" of Triangle advertisements that have appeared in

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FOR SAFE ARTERIES
of Traffic—or Electricity!
Another job on which THE CONTRACTOR WAS SAFE because HE SPECIFIED TRIANGLE
TRIANGLE PRODUCTS REWARD BUYERS!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
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COURTHOUSE
OAKLAND, CALIF.
It MUST be right!

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A FIVE STAR FEATURE!
JEANETTE MacDONALD ... NELSON EDDY ... and ...
TRIANGLE CONDUIT, WIRE AND CABLE
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ATLANTA, GA.
E. M. T. THIN WALL
CONDUIT INSTALLATION
It MUST be right!

"TRIANGLE PRODUCTS REWARD BUYERS"

Electrical Contracting, The Wholesaler's Salesman, and Electrical West

The Jobs you READ about
Hear Ye! Hear Ye!
Again—at the Alameda (Calif.) County Courthouse
The Contractor's VERDICT: "It must be TRIANGLE
CONDUIT."
TRIANGLE PRODUCTS REWARD BUYERS
TRIANGLE CONDUIT & CABLE CO., Inc.
Hoeses Herding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
NEXT ISSUE
The BIG parade
It MUST be right!

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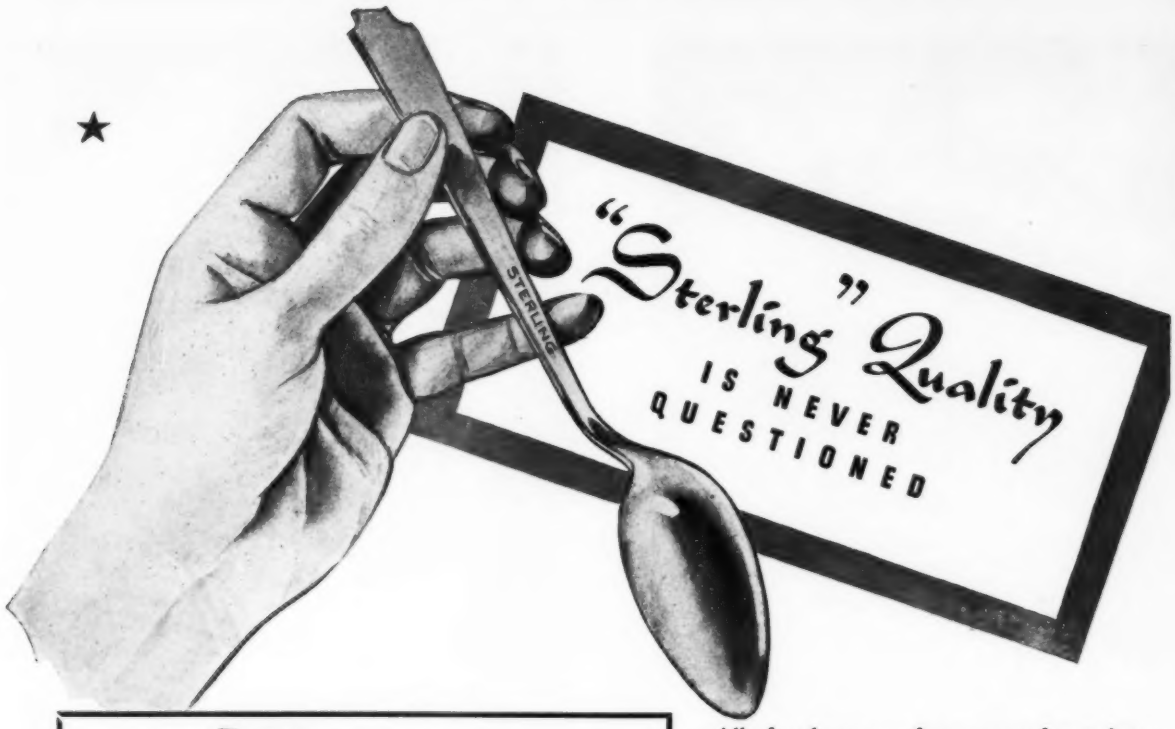
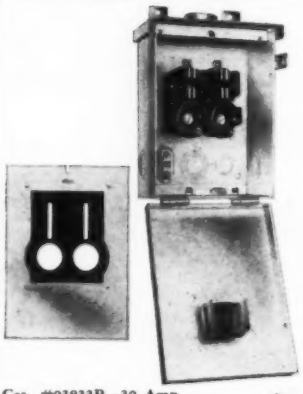


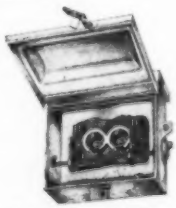
WADSWORTH WEATHERPROOF SWITCHES—

There are numerous applications for Weatherproof Switches. Recently they have been adopted quite generally on "REA" developments. WADSWORTH gives you a wide selection in Weatherproof Switches. A few are shown here.

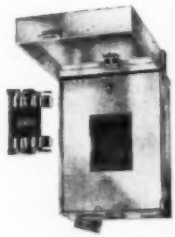


Cat. #03833P—30 Amp. Door Operated — with Dead Front Removed. Has "Hub" in Top. Aluminum Finish.

Cat. #08763 — 60 Amp. 3 Phase Service. Externally Operated. Aluminum Finish.



Cat. #025 — 30 Amp. General Purpose Weatherproof Switch Externally Operated Can be supplied with or without Hub in Top. Aluminum Finish.



Cat. #060MO — 60 Amp. Pull Cover Operated — Dead Front Device 1" Hub in Top is Standard . . . 1¼" available also. Aluminum Finish.

All of us know . . . from years of experience . . . that some things seldom vary in value. They become a Quality Standard of comparison. For example . . . STERLING SILVER . . . No one questions Sterling Quality!

. . . And so it is with Wadsworth Switches . . . They too, are built to a Quality Standard. For more than 30 years WADSWORTH has been building good switches and long ago, established a reputation for Quality which Electrical Contractors use as a Standard of comparison. There is no better example of this than Wadsworth's "Outdoor" or "Weatherproof" Line. WADSWORTH has a wide selection of such devices. Built of "GALVANNEALED" steel and finished in Aluminum. Current carrying parts are made extra heavy . . . Terminals are in plain sight . . . Cabinets are small in size but have ample wiring space . . . Easy to wire . . . Quickly installed. QUALITY is built right into every piece and part.

We're proud of our Quality Reputation. Still, you pay no more for Wadsworth's EXTRA Quality.

So we say . . . Buy Wisely . . . Buy WADSWORTH!

See your Electrical Wholesaler.

The WADSWORTH ELECTRIC MFG CO. INC.

Covington, Kentucky.